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Technical Memorandum

AMBIENT AIR QUALITY SURVEY FORT FRANCES, ONTARIO JULY, 1985

ARB-067-86-AQM

February, 1986

Ontario
Ministry of the Environment

Dr. David Balsillie, Director
Air Resources Branch

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Prepared for the
Northwestern Region
Ministry of the Environment

By
R.E. Chapman, Ph.D.
Senior Project Scientist

Air Quality and Meteorology Section
Air Resources Branch
Ministry of the Environment

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INS2-19

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1.0 SUMMARY

A mobile air monitoring unit (MAMU #2) from the Air Resources Branch conducted an air quality survey in Fort Frances in July 1985. The survey objective was to measure total reduced sulphur (TRS) and organic compounds near the Boise-Cascade (Can.) kraft pulp and paper mill, and near the secondary treatment system (lagoon) for liquid effluent from that mill. This survey provided data for comparison with a similar study conducted in 1983.

Air samples within the fenced boundary of the lagoon with the sampling probe at normal height (5 metres) resulted in the Provisional guideline of 27 ppb TRS (½-hour average) being exceeded during 5 of the 7 periods. Within 2 metres of the lagoon surface the TRS concentrations were usually 2-3 times higher, and the Provisional Guideline was exceeded during each of the 6 periods. The maximum ½-hour average concentration was 269 ppb. In general the TRS results were highly similar to the 1983 TRS results. None of the organic compounds measured by gas chromatography exceeded or approached any of their ½-hour standards or guidelines. The largest concentrations measured were those of 1-isopropyl-4-methylbenzene (p—cymene), which was not measured during a previous survey (1983) by a less sensitive gas chromatography system.

As in the 1983 study, residential areas immediately downwind of the lagoon usually had TRS concentrations roughly 30% of the lagoon values. The Provisional Guideline was exceeded during 4 of the 11 monitoring periods and the maximum ½-hour average was 56 ppb. The organic compounds concentrations were essentially the same as on the lagoon property, except for trichloromethane which only reached 5-10% of the lagoon values, and p-cymene which reached 10-20% of the lagoon values.

In the area of the kraft pulp mill the TRS provisional guideline was exceeded during 5 of the 7 monitoring periods. The maximum ½-hour average was 149 ppb. The organic compounds were present at levels comparable to the 1983 study; none of the ½-hour standards or guidelines were exceeded or approached. P-cymene levels were similar to those on the lagoon property.

2.0 INTRODUCTION

As requested by the Northwestern Region, the Monitoring and Instrumentation Development Unit of the Air Resources Branch conducted an air quality survey in Fort Frances during July 1985. The purpose of the study was to measure the total reduced sulphur (TRS) and organic compounds in the vicinity of two sources: the Boise-Cascade (Can.) kraft pulp mill, and the secondary treatment system (lagoon) for liquid effluent from that mill. This was a follow-up survey to the more intensive study carried out in September 1983.

A mobile air monitoring unit (MAMU #2) was used mainly to measure TRS and meteorological parameters, and perform gas chromatographic (GC) analyses for the organic compounds.

3.0 MAMU #2 and SURVEY STRATEGY

The MAMU #2 contained analyzers for monitoring of TRS, sulphur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), and the methane (CH_4) and non-methane components of total hydrocarbons (THC). TRS measurements were made by a fluorescent SO_2 analyzer in conjunction with a high temperature (900°C) TRS-to-SO_2 converter. Each morning during the survey the TRS measuring system was calibrated with a mixture containing 0.245 ppm hydrogen sulphide (H_2S) in zero air.

The MAMU #2 was outfitted with a gas chromatograph (Hewlett Packard 5880A) coupled to an organic preconcentrator of our own design. Ambient air was drawn at 100 ml/min through a 9 mm O.D glass cartridge containing adsorbents Florisil, Molecular Sieve 13x and Spherocarb. GC sampling periods were usually 30 minutes so that the data could be directly compared to Ministry standards and guidelines. Contaminants trapped by the adsorbents were thermally desorbed, prefocused and injected on the head of the GC columns. The sample was then analyzed in the two 25-metre cross-linked columns, SE-54 and OV-1, and two standard, flame-ionization detectors. Compounds detectable by the GC preconcentrator system included alkanes, alkenes, aromatics and chlorinated hydrocarbons. Typical detection limits were in the 0.1-1.0 ug/m^3 range.

Ambient temperature, wind speed and wind direction are important meteorological parameters that were monitored continuously during the survey periods.

Daily monitoring strategy was based on the following: (1) meteorology - primarily wind speed and direction, (2) plume presence, (3) status of specific tasks to date. All days of significant monitoring periods were ended with brief periods of background monitoring, well removed from any of the sources, as a quick check of proper instrument operation.

The secondary treatment system (lagoon) located at 8th Street and Cornwall Avenue, Fort Frances, was the top priority for this survey. When winds were northerly, monitoring was conducted at the lagoon and residential areas to the south.

The Boise-Cascade (Can.) kraft pulp mill was the other source of interest for this survey. Monitoring was usually performed during periods of southerly or westerly winds, to allow comparison with the results from the fixed monitoring stations located north and east of the mill.

4.0 RESULTS

The results of the study are summarized in Tables 1-3 (pages 8-11), and represent downwind measurements in the sense that every attempt was made to be in the plume impingement zone. The locations of all monitoring sites, as numbered in Tables 1 and 2, are shown in Figure 1. The entire set of GC results is included in Appendix 1. Appendix 2 contains time-concentration plots for several parameters, including TRS, during most of the monitoring periods.

The Provisional Guideline for point-of-impingement concentrations of TRS ($\frac{1}{2}$-hour average) from a kraft pulp mill is 40 ug/m^3, expressed as hydrogen sulphide. The TRS analyzer in MAMU #2 measures concentration in terms of parts per million (ppm), by volume. For this report the Provisional Guideline of 40 ug/m^3 was converted to ppm units of hydrogen sulphide, 0.027 ppm (27 ppb).

4.1 Lagoon

4.1.1 Total Reduced Sulphur

As shown in Table 1, within the fenced boundary of the lagoon there were 7 monitoring periods when the normal sampling probe was used (see footnote 2, Table 1). The Provisional Guideline of 27 ppb for $\frac{1}{2}$-hour average was exceeded during 5 of the 7 periods. The maximum $\frac{1}{2}$-hour average concentration was 151 ppb. When the funnel and sampling hose

were used to monitor within 2 metres of the lagoon surface the concentrations were usually 2-3 times higher, the Provisional Guideline was exceeded during each period, and the maximum ½-hour average concentrations was 269 ppb. The maximum level (269 ppb) occurred during a period of dewatering lagoon #2 (into lagoon #1) in preparation for annual dredging of the lagoons.

In the residential area near the lagoon there were 11 monitoring periods, of which 4 periods exceeded 27 ppb (½-hour ave.). The maximum ½-hour average concentration was 56 ppb.

In general the TRS results were highly similar to the 1983 results, in both the lagoon area and the residential area.

4.1.2 Gas Chromatography Results

The GC results are summarized in Table 3. Near the lagoon or whenever the total hydrocarbons analyzer showed relatively higher levels of hydrocarbons (greater than 3 ppm), the sampling period for the GC system was usually limited to 30 minutes or less. That lessened the probability of overloading the GC column and missing or mis-identifying some of the contaminants. For other periods the GC sampling time was usually 1 hour. The detection limits for all compounds were less than 1 ug/m^3, except for some chlorinated organics which were between 1 ug/m^3 and 5 ug/m^3. In several ways the GC system was more sensitive and sophisticated than during the previous survey (1983).

In comparison with the results of 1983 there is no significant change in the concentrations of the first 15 compounds listed in Table 3. None of the concentrations exceeded or approached any applicable Ontario standards or guidelines.

The improved GC system was able to detect 1-isopropyl-4-methylbenzene (P-cymene) in concentrations higher than those of any other compound detected in the study. This organic is one of the minor products of the wood pulp sulphite process and probably results as a break-down product of terpenes that are present in the wood. Since p-cymene has no Ontario standard or guideline and was not monitored in the 1983 study, the magnitude of the concentration can not be commented upon.

The bottom section of Table 3 summarizes the results into several classes of hydrocarbons. In general, the use of a funnel and sampling hose to sample within 2 metres of the lagoon surface doubled the concentrations obtained at the normal probe position (footnote, Table 1).

In the residential area near the lagoon the concentrations of the first 15 compounds in Table 3 were effectively the same as on the lagoon property, except for trichloromethane which only reached 5-10% of the lagoon area values. P-cymene was found in the residential area also, but only at 10-20% of the levels found on the lagoon property. In general the chlorinated organics and the aromatics (benzene, toluene, xylenes and their derivatives) were much lower in the residential area while the alkanes and alkenes were roughly unchanged from the lagoon area concentrations. In comparison with the results of 1983 there is no significant change in the concentrations of the first 15 compounds listed in Table 3.

4.2 Kraft Pulp Mill

4.2.1 Total Reduced Sulphur

As Table 2 shows, 5 out of 7 monitoring periods near the pulp mill included ½-hour periods when the TRS average concentration exceeded the Provisional guideline of 27 ppb. The largest ½-hour average was 149 ppb, and a search of the maximum readings (1-minute average) printed in the statistics section for each periods' results (Appendix 1) showed that every monitoring period reached a concentration of 39 ppb or greater. The largest maximum reading was 511 ppb.

There was no attempt made to determine a relationship between TRS concentration and distance from the kraft mill.

4.2.2 Gas Chromatography Results

The GC results shown in Table 3 for the kraft mill area showed no significant differences from the 1983 study results that couldn't be explained by a more sensitive and sophisticated GC system for 1985. None of the ½-hour standards or guidelines were exceeded or approached.

P-cymene was detected in amounts similar to those on the lagoon property. The chlorinated organics were lower near the kraft mill than in the lagoon area, but the alkanes, alkenes and aromatics were greater than in the lagoon area, which may represent vehicle emissions from the heavy equipment and trucks in the kraft mill area.

5.0 DISCUSSION

This was a follow-up survey to check some results of the 1983 study and provide current data on problems of much public concern. To compare results from the two studies one must keep in mind two of the changes made in the instrumentation since the 1983 study. The total reduced sulphur analyzer now uses a modified TRS-to-SO_2 converter that achieves approximately 95% conversion efficiencies for all of the sulphur compounds found in the 1983 survey. That includes dimethyl disulphide (DMDS), the major sulphide component in the lagoon emissions (1983 survey), for which the analyzer response is doubled due to the extra sulphur atom in each molecule (compared to the other TRS compounds). If the composite TRS results from the 1983 survey are adjusted to include a double contribution from DMDS, then the adjusted 1983 TRS results are quite similar to the current TRS results in the lagoon area and the adjacent residential area.

The other change to consider, when comparing the GC results for the two surveys, is the improved sensitivity and sophisication of the GC system. The 1985 GC system detected many of the compounds more often, but the levels detected (in general) compared closely with the 1983 levels (on the fewer occasions when they were detected). The improved system allowed p-cymene to be detected but the significance of the levels is unknown. One problem with our using a Nafion membrane dryer to remove water vapour from the air samples entering the GC is that several of the monoterpene compounds naturally emitted by vegetation are rearranged by the dryer into other compounds, with p-cymene being the largest product of the rearranging. For this reason the p-cymene concentrations reported herein are upper limits and the actual ambient concentrations are probably somewhat less. It should be noted that p-cymene was detected in a previous MOE sample (July, 1980) of the dry foam and effluent from the Fort Frances Boise-Cascade lagoon as one of the major organic compounds present. That situation apears to be unchanged.

In the area near the kraft pulp mill, there were 3 periods when monitoring occurred adjacent to 1 of the 2 regional fixed monitoring stations. The charted record of the region's TRS analyzers showed profiles nearly identical to those of the MAMU #2 TRS analyzer on those 3 occasions. As expected, however, the magnitudes (concentrations) did not agree. For 2 of the periods (sites 20, 21) the MAMU #2 detected 1-hour averages of 9.3 ppb while the region's analyzers detected 6.3 ppb in each case. That 68% response level for the region's

analyzers was probably due to their use of the original - equipment low temperature (300°C) TRS converter, which has been shown to be adequate for hydrogen sulphide but not for the other reduced sulphur compounds found near the kraft pulp mill. The TRS converter (900°C) used in MAMU #2 is 95% efficient for all of those reduced sulphur compounds, including methyl mercaptan, the major component in the kraft mill area during the 1983 survey. In light of these facts the 68% relative response seems appropriate. For the third period (site 25) the region's analyzer gave 29 pb for the 1-hour average compared to 25 ppb for MAMU #2, a relative response of 116%. If the impinging plume was mainly hydrogen sulphide on this occasion, then the analyzers would give roughly equivalent responses and the fairly small difference (4 ppb; 16%) is acceptable for two (slightly) separated analyzers within a plume of unknown size and homogeneity. It is expected that the region will replace the original TRS converter (300°C) with a high temperature (900°C) converter in the near future.

TABLE 1
Fort Frances Survey July 1985 Total Reduced Sulphur (ppm)
Source: Boise Cascade Lagoon

Site[1]	Location	Time Period	Maximum ½-hour Average	Period Arith. Mean	Comments[2]
1-L	N end Lagoon #2	06-July-85 13:14-15:17	0.046 0.087	0.068	normal probe funnel used
2-L	NW corner Lagoon #2	07-July-85 11:27-13:21	0.086	0.052	
3-L	Road between Lagoons #1, #2. 40m from S end	07-July-85 13:34-14:06	0.007	0.007	
4-L	Between Lagoons #1, #2 at S end	07-July-85 14:12-14:58	0.126	0.109	Funnel
5	Eighth St., S of Lagoon #2	08-July-85 10:34-12:44	0.028	0.020	
6-L	SE corner Lagoon #3	08-July-85 12:59-15:05	0.024 0.066	0.036	normal probe funnel used
7	Cornwall Av. at Eighth St.	08-July-85 15:18-16:27	0.003	0.003	
8	Eighth St., S of Lagoon #2	09-July-85 12:15-15:10	0.056	0.040	
9	1051 Walker Ave.	09-July-85 15:35-16:07	0.009	0.009	
10	Fifth St., 200m E of RR tracks	10-July-85 10:05-11:07	0.005	0.004	
11	210 Sixth St.	10-July-85 11:37-12:00	-	0.003	
12	1046 Cornwall Ave.	10-July-85 12:17-13:19	0.018	0.016	
13	Eighth St., S of Lagoon #1	10-July-85 13:34-14:41	0.028	0.026	
14-L	SW corner of Lagoon #1	10-July-85 14:54-15:56	0.054	0.042	

1. See Figure 1; -L means site is on Lagoon property
2. Normal probe has 5 m sampling height, approx. 3-10 m horiz. from Lagoon edge; the funnel and sampling hose sampled within 2 m of lagoon surface.

TABLE 1 (Continued)
Fort Frances Survey July 1985 Total Reduced Sulphur (ppm)
Source: Boise Cascade Lagoon

Site[1]	Location	Time Period	Maximum ½-hour Average	Period Arith. Mean	Comments[2]
15-L	SW corner of Lagoon #1	10-July-85 15:57-16:59	0.269	0.233	Funnel, maint. crew pumps lagoon #2 to lagoon #1
16	1064 Cornwall Ave., 50 m S of Eighth St.	10-July-85 17:31-18:05	0.035	0.036	
17	106 Sixth St.	10-July-85 18:25-19:00	0.020	0.020	
18	1031 Walker Ave.	11-July-85 11:57-12:59	0.005	0.003	
26-L	SE Corner of Lagoon #2	14-July-85 14:56-16:10	0.151	0.127	
27-L	NW Corner of Lagoon #2	15-July-85 10:01-11:07	0.119	0.110	Funnel, winds from Lagoon #3 aerators
28-L	SE Corner of Lagoon #3	15-July-85 11:26-12:28	0.048	0.045	
29-L	SE Corner of Lagoon #3	15-July -85 12:32-13:08	0.199	0.188	Funnel
30	Eighth St. at Cornwall Ave.	15-July-85 14:11-14:44	0.014	0.014	

1. See Figure 1; -L means site is on Lagoon property
2. Normal probe has 5 m sampling height, approx. 3-10 m horiz. from Lagoon edge; the funnel and sampling hose sampled within 2 m of lagoon surface.

TABLE 2
Fort Frances Survey July 1985 Total Reduced Sulphur (ppm)
Source: Boise Cascade Kraft Mill

Site[1]	Location	Time Period	Maximum ½-hour Average	Period Arith. Mean	Comments
19	Sinclair St. at Portage Ave.	11-July-85 13:50-14:55	0.031	0.026	
20	Victoria Ave., at Hospital	11-July-85 15:22-16:55	0.011	0.010	beside NW Region monit. station
21	Church St. at Soc. Services bldg.	12-July-85 10:07-11:10	0.012	0.009	beside NW Region Monit. station
22	NW Corner of Portage and Nelson	12-July-85 11:22-13:30	0.149	0.086	
22	NW Corner of Portage and Nelson	12-July-85 13:32-14:18	0.114	0.080	low values; prototype TRS scrubber used for part of period
23	346 Church St.	12-July-85 15:36-16:07			gasoline fumes
24	Sinclair St., 30 m W. of Victoria Ave.	13-July-85 11:25-13:06	0.037	0.030	
25	Victoria Ave. at Hospital	13-July-85 13:23-14:46	0.030	0.021	beside NW Region monit. station

1. See Figure 1

TABLE 3
GC Results at Boise-Cascade Secondary Treatment Facility (Lagoon), Residential Area Near Lagoon, and Kraft Mill Area

Compound	Lagoon		Residential		Kraft Mill Area	
	Mean	Max.	Mean	Max.	Mean	Max.
Pentane	21	108	34	132	126	302
3-Methylpentane	4	24	6	30	23	47
Hexane	7	36	9	40	32	63
Benzene	21	49	12	29	30	68
Iso-octane (2,2,4-Trimethylpentane)	4	25	4	18	25	50
Heptane	2	12	2	9	10	19
Toluene	11	36	8	30	31	73
Octane	N.D.	N.D.	N.D.	1	N.D.	N.D.
Ethylbenzene	1	5	1	4	5	11
M,P-Xylene	8	25	5	19	25	51
O-xylene	1	6	1	5	6	13
Isopropylbenzene	N.D.	N.D.	N.D.	N.D.	N.D.	1
Decane	2	13	2	21	8	14
Trichloromethane (chloroform)	249	964	16	53	24	54
n-propylbenzene	0.3	3	N.D.	1	2	5

Sample Probe	Funnel mean/max.	Normal mean/max.				
1-isopropyl-4-methylbenzene (P-cymene)	558/1185	163/466	37	106	303	520
chlorinated organics	382/964	164/522	21	67	54	128
Alkanes	214/1252	165/793	234	1063	957	2511
Alkenes	14/66	25/90	23	91	111	335
Aromatics	529/1041	222/531	72	172	457	729
Total Hydrocarbons	1146/2195	583/1158	359	1402	1618	3495

1. Sampling period varied from 10 to 60 minutes, roughly inversely proportional to the expected hydrocarbon loadings.
2. There was no specific relationship, intended or actual, between the occurrence of maximum values and the length of the sampling period

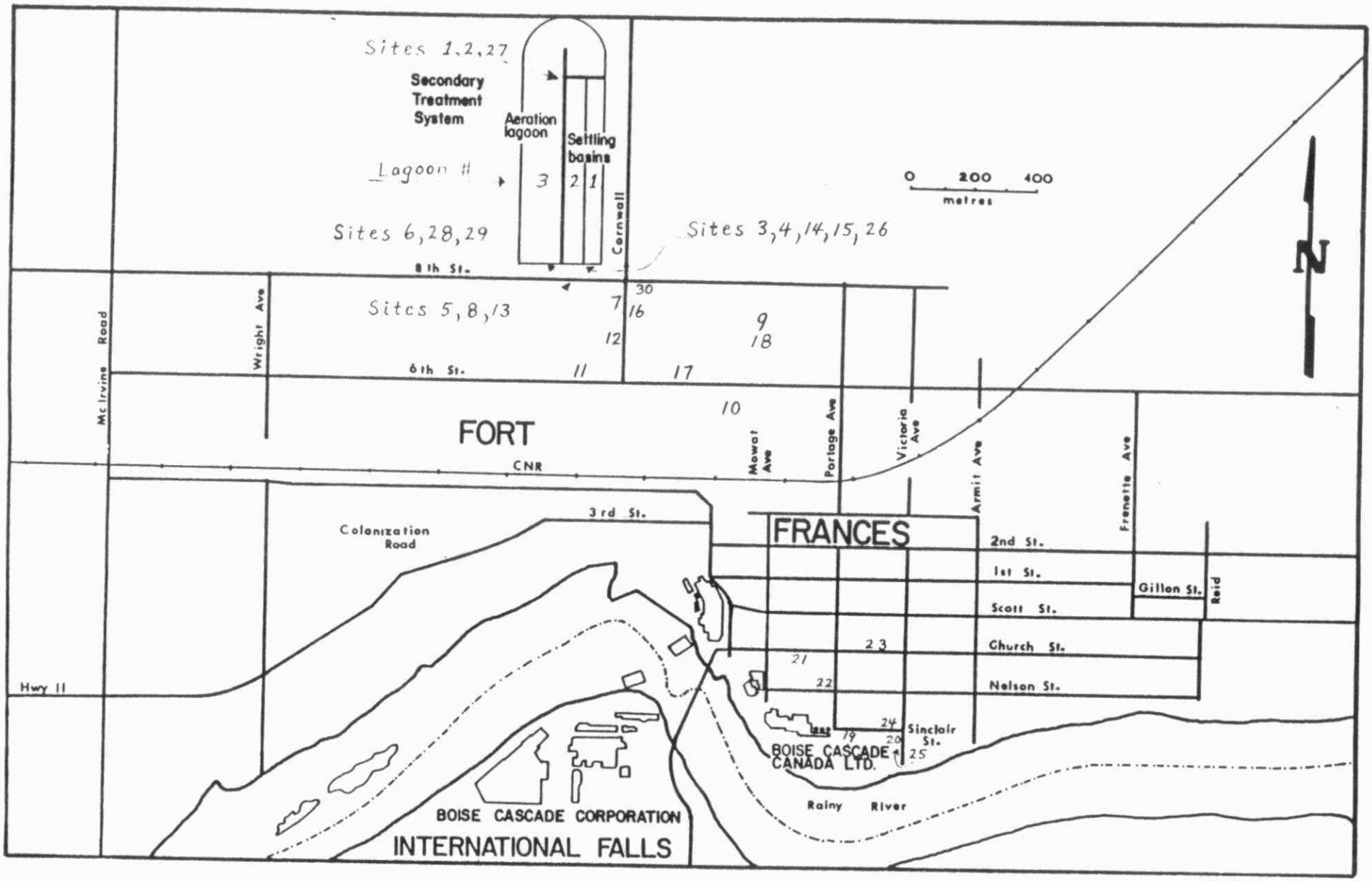


Figure 1: Monitoring Site Numbers, 1985

APPENDIX 1

COMPLETE GAS CHROMATOGRAPH RESULTS
ug/m^3

Locations for the GC sampling periods are designated by the site number, which is described in Tables 1 and 2.

/

FORT FRANCES SURVEY-85

MANU#2
JULY 6,1985

MONITORING PERIOD	0629	0628
Site	I-L	I-L
TIME	1306-1406	1406-1506
PROPANE	2.90	2.40
PROPADIENE		
PROPYNE		
CHLOROMETHANE		
CYCLOPROPANE		
2-METHYLPROPANE		
CHLOROETHENE		
1-BUTENE		
1,3-BUTADIENE		
BUTANE	20.92	30.39
1-BUTYNE		
CHLOROETHANE		
3-METHYL-1-BUTENE		
2-METHYLBUTANE	16.60	34.74
1-PENTENE		1.10
PENTANE	11.55	21.57
2-METHYL-1,3-BUTADIENE	13.19	10.83
TRANS-2-PENTENE +	0.96	1.86
CIS-2-PENTENE +	1.31	2.50
DICHLOROMETHANE		
2-METHYL-2-BUTENE	3.14	6.95
3-CHLOROPROPENE		
2,2-DIMETHYLBUTANE		
4-METHYL-1-PENTENE		
3-METHYL-1-PENTENE		
CYCLOPENTANE	0.88	1.30
2,3-DIMETHYLBUTANE	0.99	1.24
2-METHYLPENTANE	4.22	5.42
3-METHYLPENTANE	2.92	3.73
1-HEXENE		
CIS-1,2-DICHLOROETHENE		
2-CHLOROBUTANE		
HEXANE	5.57	6.43
TRICHLOROMETHANE	154.42	150.02
TRANS-3-HEXENE		
3-CHLORO-2-METHYLPROPENE		
METHYLCYCLOPENTANE	2.13	2.38
1,2-DICHLOROETHANE		
1,1,1-TRICHLOROETHANE		
1-CHLOROBUTANE		
BENZENE	9.48	17.00
TETRACHLOROMETHANE		
CYCLOHEXANE		
2,3-DIMETHYLPENTANE +	3.73	4.49
2-METHYLHEXANE +	3.95	4.75
CYCLOHEXENE		
3-METHYLHEXANE	1.80	2.11
1,2-DICHLOROPROPANE		
2,3-DICHLOROPROPENE		
TRICHLOROETHENE		
2,2,4-TRIMETHYLPENTANE	2.49	3.50

1-HEPTENE		
HEPTANE	1.65	1.71
1-CHLORO-3-METHYLBUTANE		
TRANS-2-HEPTENE		
METHYLCYCLOHEXANE	0.79	0.79
4-METHYLCYCLOHEXENE		
2,5-DIMETHYLHEXANE		
1-CHLOROPENTANE		
1,1,2-TRICHLOROETHANE		
TOLUENE	9.67	13.42
1,3-DICHLOROPROPANE		
2-METHYLHEPTANE	0.81	0.71
4-METHYLHEPTANE		
3-METHYLHEPTANE	0.79	0.71
1,2-DIBROMOETHANE		
1-OCTENE		
TRANS12DIMETHYLCYCLOHEXAN		
TRANS-4-OCTENE		
TETRACHLOROETHENE		
2-METHYL-1-HEPTENE	0.73	0.64
OCTANE		
2-OCTENE		
CIS12DIMETHYLCYCLOHEXAN		
CHLOROBENZENE		
ETHYLCYCLOHEXANE +		
PROPYLCYCLOPENTANE +		
1-CHLOROHEXANE		
ETHYLBENZENE	1.54	2.02
m/p-XYLENE	5.53	6.74
4-METHYLOCTANE		
2-METHYLOCTANE		
STYRENE		
1,4-DICHLOROBUTANE		
O-XYLENE	1.71	1.49
1,1,2,2-TETRACHLOROETHANE		
1,2,3-TRICHLOROPROPANE		
1-NONENE		
NONANE	0.86	1.78
ISOPROPYLBENZENE		
2-CHLOROTOLUENE		1.07
3-CHLOROTOLUENE		
PROPYLBENZENE	1.63	
4-CHLOROTOLUENE		
3-ETHYLTOLUENE		
4-ETHYLTOLUENE		2.51
1,3,5-TRIMETHYLBENZENE	8.23	10.57
2-ETHYLTOLUENE		
tert-BUTYLBENZENE +	4.57	22.71
1,2,4-TRIMETHYLBENZENE +		19.21
1,3-DICHLOROBENZENE		
1-DECENE		
(CHLOROMETHYL)BENZENE		
1,5-DICHLOROPENTANE		86.70
DECANE	3.71	
sec-BUTYLBENZENE		
3-(CHLOROMETHYL)HEPTANE		9.80
1,2,3-TRIMETHYLBENZENE		
1ISOPROPYL4METHYLBENZENE	224.71	867.10
1,2-DICHLOROBENZENE	2.76	10.70
INDAN	3.10	61.49
BUTYLCYCLOHEXANE		2.90
1,3-DIETHYLBENZENE		
1,4-DIETHYLBENZENE +		9.07
BUTYLBENZENE +		8.05
1,2-DIETHYLBENZENE		3.10
UNDECANE		7.64

DECAHYDRONAPTHALENE	17.12	27.25
1235-TETRAMETHYLBENZENE		6.82
1234-TETRAMETHYLBENZENE		22.72
1234-TETRAHYDRONAPTHALENE		
1,4-DIISOPROPYLBENZENE		
DODECANE		1.61

Total compounds identified	38.00	49.00
Total # of peaks	83.00	134.00
Total area of peaks	11442.29	40860.23
Area of identified peaks	7805.98	22941.53
Area % identified peaks	68.22	56.15
Total hydrocarbons ug/m3:	553.06	1465.73
Alkanes ug/m3	85.46	134.92
Cycloalkanes ug/m3	3.80	7.37
Alkenes ug/m3	19.33	23.88
Cycloalkenes ug/m3	0.00	0.00
Alkynes ug/m3	0.00	0.00
Aromatics ug/m3	287.29	1041.27
Chlorinated alkanes ug/m3	154.42	246.52
Chlorinated alkenes ug/m3	0.00	0.00
Chlorinated aromatics ug/m3	2.76	11.77
Toluene:Ethylbenzene	6.28	6.64
Benzene:Ethylbenzene	6.16	8.42
Xylenes:Ethylbenzene	4.70	4.07
Ethylbenzene:Ethylbenzene	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 7,1985

MONITORING PERIOD	072B	072B	073B	074B
Site	2-L	2-L	3-L	4-L
TIME	1124-1154	1154-1254	1330-1400	1435-1455
PROPANE	14.91	20.35	14.36	120.59
PROPADIENE				
PROPYNE				
CHLOROMETHANE				
CYCLOPROPANE				
2-METHYLPROPANE				
CHLOROETHENE				
1-BUTENE	4.09		7.24	
1,3-BUTADIENE		4.31		
BUTANE	72.08	2.39	249.89	612.85
1-BUTYNE				
CHLOROETHANE				
3-METHYL-1-BUTENE				
2-METHYLBUTANE	54.34		178.41	149.19
1-PENTENE	1.73	1.49	4.93	4.37
PENTANE	34.40	28.41	107.54	95.63
2-METHYL-1,3-BUTADIENE	7.36	8.58	14.30	11.48
TRANS-2-PENTENE +	2.19	2.04	6.81	6.04
CIS-2-PENTENE +	3.92	3.77	12.15	10.69
DICHLOROMETHANE				
2-METHYL-2-BUTENE	13.26	10.79	38.83	29.18
3-CHLOROPROPENE				
2,2-DIMETHYLBUTANE			2.61	2.71
4-METHYL-1-PENTENE				
3-METHYL-1-PENTENE				
CYCLOPENTANE	2.85	2.39	8.65	8.05
2,3-DIMETHYLBUTANE	3.14	2.89	8.85	8.74
2-METHYLPENTANE	13.80	13.36	38.28	38.36
3-METHYLPENTANE	9.34	9.11	24.13	24.38
1-HEXENE				
CIS-1,2-DICHLOROETHENE				
2-CHLOROBUTANE				
HEXANE	13.17	14.56	34.58	36.16
TRICHLOROMETHANE	226.29	97.86	35.04	388.88
TRANS-3-HEXENE			1.93	
3-CHLORO-2-METHYLPROPENE			19.69	16.23
METHYLCYCLOPENTANE	7.10	6.70	19.24	20.01
1,2-DICHLOROETHANE				
1,1,1-TRICHLOROETHANE				
1-CHLOROBUTANE				
BENZENE	19.87	25.79	27.94	34.20
TETRACHLOROMETHANE				
CYCLOHEXANE			4.08	4.15
2,3-DIMETHYLPENTANE +	11.27	11.10	28.69	31.02
2-METHYLHEXANE +	11.93	11.76	30.39	32.85
CYCLOHEXENE				
3-METHYLHEXANE	4.87	5.01	12.36	13.22
1,2-DICHLOROPROPANE				
2,3-DICHLOROPROPENE				
TRICHLOROETHENE	2.54		6.81	7.31
2,2,4-TRIMETHYLPENTANE	8.85	8.40	22.73	24.58

1-HEPTENE				
HEPTANE	4.49	4.26	10.44	11.64
1-CHLORO-3-METHYLBUTANE				
TRANS-2-HEPTENE				
METHYLCYCLOHEXANE	2.76	2.59	7.35	7.85
4-METHYLCYCLOHEIENE				
2,5-DIMETHYLHEXANE			2.38	2.42
1-CHLOROPENTANE				
1,1,2-TRICHLORDETHANE				
TOLUENE	20.56	20.56	35.74	32.25
1,3-DICHLORDPROPANE				
2-METHYLHEPTANE	2.06	1.74	5.24	5.29
4-METHYLHEPTANE			1.96	1.92
3-METHYLHEPTANE	2.07	1.74	4.47	4.80
1,2-DIBROMOETHANE				
1-OCTENE				
TRANS12DIMETHYLCYCLOHEXAN				
TRANS-4-OCTENE				
TETRACHLORGETHENE				
2-METHYL-1-HEPTENE	1.71	1.27	3.86	3.90
OCTANE				
2-OCTENE				
CIS12DIMETHYLCYCLOHEXAN				
CHLOROBENZENE				
ETHYLCYCLOHEXANE +				
PROPYLCYCLOPENTANE +				
1-CHLOROHEXANE				
ETHYLBENZENE	3.98	3.04	5.42	4.43
m/p-XYLENE	14.87	10.76	25.46	22.13
4-METHYLOCTANE			3.25	
2-METHYLOCTANE			2.17	
STYRENE				
1,4-DICHLOROBUTANE				
O-XYLENE	3.60	2.51	6.31	5.43
1,1,2,2-TETRACHLORDETHANE				
1,2,3-TRICHLORDPROPANE				
1-NONENE				
NONANE	1.40		2.31	3.31
ISOPROPYLBENZENE				
2-CHLOROTOLUENE				
3-CHLOROTOLUENE				
PROPYLBENZENE			2.51	
4-CHLOROTOLUENE			1.93	3.35
3-ETHYLTOLUENE	3.93	2.36	5.61	5.39
4-ETHYLTOLUENE				
1,3,5-TRIMETHYLBENZENE			5.13	6.87
2-ETHYLTOLUENE			2.91	
tert-BUTYLBENZENE +				20.41
1,2,4-TRIMETHYLBENZENE +				17.39
1,3-DICHLOROBENZENE				
1-DECENE				
(CHLOROMETHYL)BENZENE				
1,5-DICHLOROPENTANE				46.14
DECANE	5.53			12.31
sec-BUTYLBENZENE				
3-(CHLOROMETHYL)HEPTANE				
1,2,3-TRIMETHYLBENZENE	5.40		3.57	9.47
1ISOPROPYL4METHYLBENZENE	365.10	466.04	36.17	172.72
1,2-DICHLOROBENZENE				
INDAN	2.56		3.80	
BUTYLCYCLOHEXANE				
1,3-DIETHYLBENZENE				6.69
1,4-DIETHYLBENZENE +				8.10
BUTYLBENZENE +				7.19
1,2-DIETHYLBENZENE				
UNDECANE	10.43	6.16	7.75	13.79

DECAHYDRONAPTHALENE	25.47	11.99	23.13	
1235-TETRAMETHYLBENZENE				
1234-TETRAMETHYLBENZENE				
1234-TETRAHYDRONAPTHALENE				
1,4-DIISOPROPYLBENZENE				
DODECANE	3.34		5.90	

Total compounds identified	41.00	33.00	51.00	52.00
Total # of peaks	80.00	64.00	86.00	111.00
Total area of peaks	10877.60	10191.94	15186.78	19319.97
Area of identified peaks	7676.00	6775.27	10805.30	12100.60
Area % identified peaks	70.57	66.48	71.15	62.63
Total hydrocarbons ug/m3:	1022.56	814.10	1158.13	2195.09
Alkanes ug/m3	281.42	141.25	792.73	1251.66
Cycloalkanes ug/m3	12.71	11.68	39.32	46.86
Alkenes ug/m3	34.26	32.25	90.05	65.66
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00
Aromatics ug/m3	465.34	531.06	172.56	375.80
Chlorinated alkanes ug/m3	226.29	97.86	35.04	435.02
Chlorinated alkenes ug/m3	2.54	0.00	26.56	22.54
Chlorinated aromatics ug/m3	0.00	0.00	1.93	3.35
Toluene:Ethylbenzene	5.17	6.76	6.59	7.26
Benzene:Ethylbenzene	4.99	8.48	5.15	7.72
Xylenes:Ethylbenzene	4.64	4.37	5.86	6.22
Ethylbenzene:Ethylbenzene	1.00	1.00	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 8,1985

MONITORING PERIOD	0828	0828	0838	0838	0848
Site	5	5	6-L	6-L	7
TIME	1034-1134	1134-1234	1300-1320	1422-1452	1516-1616
PROPANE	2.28	6.44	6.36	1.52	39.46
PROPADIENE					
PROPYNE					
CHLOROMETHANE					
CYCLOPROPANE					
2-METHYLPROPANE					67.28
CHLOROETHENE					
1-BUTENE					
1,3-BUTADIENE					
BUTANE	3.75	7.03	7.58	5.17	353.63
1-BUTYNE					
CHLOROETHANE					
3-METHYL-1-BUTENE					
2-METHYLBUTANE	3.75	36.43	5.10	3.88	224.46
1-PENTENE					6.65
PENTANE	2.97	19.12	3.39	2.77	131.82
2-METHYL-1,3-BUTADIENE	5.08	6.10	8.07	9.17	10.83
TRANS-2-PENTENE *					8.13
CIS-2-PENTENE *					14.71
DICHLOROMETHANE					
2-METHYL-2-BUTENE					41.81
3-CHLOROPROPENE					
2,2-DIMETHYLBUTANE					3.19
4-METHYL-1-PENTENE					
3-METHYL-1-PENTENE					
CYCLOPENTANE		1.35			12.66
2,3-DIMETHYLBUTANE					11.42
2-METHYLPENTANE	1.41	5.14			48.93
3-METHYLPENTANE	1.32	3.30			29.52
1-HEXENE					2.41
CIS-1,2-DICHLOROETHENE					
2-CHLOROBUTANE					
HEXANE	1.92	11.14		1.53	15.14
TRICHLOROMETHANE	12.09	17.39		31.84	21.06
TRANS-3-HEXENE					2.21
3-CHLORO-2-METHYLPROPENE					
METHYLCYCLOPENTANE	0.78	1.17			21.49
1,2-DICHLOROETHANE					
1,1,1-TRICHLOROETHANE					
1-CHLOROBUTANE					
BENZENE	9.06	14.22	24.26	16.46	28.53
TETRACHLOROMETHANE					
CYCLOHEXANE					4.07
2,3-DIMETHYLPENTANE *	1.37	5.72			26.16
2-METHYLHEXANE *	1.45	6.06			27.71
CYCLOHEXENE					
3-METHYLHEXANE	0.68	3.90			11.34
1,2-DICHLOROPROPANE					
2,3-DICHLOROPROPENE					
TRICHLOROETHENE					6.06
2,2,4-TRIMETHYLPENTANE	1.17	2.35			17.52

1-HEPTENE					
HEPTANE	0.69	2.60			9.30
1-CHLORO-3-METHYLBUTANE					
TRANS-2-HEPTENE					0.98
METHYLCYCLOHEXANE		0.64			6.41
4-METHYLCYCLOHEXENE					
2,5-DIMETHYLHEXANE					1.82
1-CHLOROPENTANE					
1,1,2-TRICHLOROETHANE					
TOLUENE	4.25	15.26	4.20	6.74	30.47
1,3-DICHLOROPROPANE					
2-METHYLHEPTANE					3.99
4-METHYLHEPTANE					1.42
3-METHYLHEPTANE					3.37
1,2-DIBROMOETHANE					
1-OCTENE					
TRANS12DIMETHYLCYCLOHEXAN					
TRANS-4-OCTENE					
TETRACHLOROETHENE					
2-METHYL-1-HEPTENE					3.86
OCTANE					
2-OCTENE					
CIS12DIMETHYLCYCLOHEXAN					
CHLOROBENZENE					
ETHYLCYCLOHEXANE +					1.02
PROPYLCYCLOPENTANE +					1.37
1-CHLOROHEXANE					
ETHYLBENZENE	0.82	1.19		1.74	4.16
m/p-XYLENE	3.40	1.83	4.12	8.34	18.98
4-METHYLOCTANE					2.80
2-METHYLOCTANE					1.96
STYRENE					
1,4-DICHLOROBUTANE					
O-XYLENE	1.04	0.46		2.20	4.75
1,1,2,2-TETRACHLOROETHANE					
1,2,3-TRICHLOROPROPANE					
1-NONENE					
NONANE				1.96	5.43
ISOPROPYLBENZENE					
2-CHLOROTOLUENE					
3-CHLOROTOLUENE					
PROPYLBENZENE					
4-CHLOROTOLUENE					2.49
3-ETHYLTOLUENE	0.81			3.02	6.45
4-ETHYLTOLUENE					
1,3,5-TRIMETHYLBENZENE				3.73	
2-ETHYLTOLUENE					2.85
tert-BUTYLBENZENE +				20.79	19.99
1,2,4-TRIMETHYLBENZENE +				18.69	
1,3-DICHLOROBENZENE					
1-DECENE					
(CHLOROMETHYL)BENZENE					
1,5-DICHLOROPENTANE				40.35	
DECANE				12.60	21.40
sec-BUTYLBENZENE					
3-(CHLOROMETHYL)HEPTANE				8.42	
1,2,3-TRIMETHYLBENZENE				7.97	9.09
1ISOPROPYL4METHYLBENZENE	26.25	56.15	21.21	80.46	24.55
1,2-DICHLOROBENZENE					
INDAN					3.61
BUTYLCYCLOHEXANE					
1,3-DIETHYLBENZENE	1.25				
1,4-DIETHYLBENZENE +				11.17	3.90
BUTYLBENZENE +				9.91	6.20
1,2-DIETHYLBENZENE				2.47	
UNDECANE	6.85	1.98	5.23	22.46	

DECAHYDRONAPTHALENE	14.32	3.09	9.59	38.86	
1235-TETRAMETHYLBENZENE				27.49	
1234-TETRAMETHYLBENZENE					
1234-TETRAHYDRONAPTHALENE				16.67	8.13
1,4-DIISOPROPYLBENZENE				17.49	
DODECANE	2.00			8.67	3.81

Total compounds identified	26.00	25.00	10.00	28.00	55.00
Total # of peaks	56.00	38.00	20.00	88.00	150.00
Total area of peaks	4397.31	4778.57	1095.30	13666.36	39280.07
Area of identified peaks	1963.15	4009.86	571.34	3449.09	25890.87
Area % identified peaks	45.10	83.91	52.16	25.24	65.91
Total hydrocarbons ug/m3:	110.78	230.06	99.13	444.54	1401.92
Alkanes ug/m3	31.61	111.21	27.66	60.56	1062.88
Cycloalkanes ug/m3	0.78	3.16	0.00	0.00	47.02
Alkenes ug/m3	5.08	6.10	8.07	9.17	90.79
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00	0.00
Aromatics ug/m3	61.22	92.20	63.40	294.20	171.66
Chlorinated alkanes ug/m3	12.09	17.39	0.00	80.61	21.00
Chlorinated alkenes ug/m3	0.00	0.00	0.00	0.00	6.08
Chlorinated aromatics ug/m3	0.00	0.00	0.00	0.00	2.49
Toluene:Ethylbenzene	5.18	12.82		3.87	7.32
Benzene:Ethylbenzene	11.07	11.95		9.46	6.86
Xylenes:Ethylbenzene	5.41	1.92		6.06	5.70
Ethylbenzene:Ethylbenzene	1.00	1.00		1.00	1.00

FORT FRANCES SURVEY-85

MANU#2
JULY 9,1985

MONITORING PERIOD	091B	091B	091B	092B
Site	8	8	8	9
TIME	1215-1300	1309-1409	1409-1509	1534-1614
PROPANE	3.84	8.51	0.82	2.24
PROPADIENE				
PROPYNE				
CHLOROMETHANE				
CYCLOPROPANE				
2-METHYLPROPANE				
CHLOROETHENE				
1-BUTENE		1.27		
1,3-BUTADIENE				
BUTANE	2.09	7.61	2.38	3.84
1-BUTYNE				
CHLOROETHANE				
3-METHYL-1-BUTENE				
2-METHYLBUTANE	31.73	35.67		4.27
1-PENTENE				
PENTANE	23.26	19.54	1.45	2.68
2-METHYL-1,3-BUTADIENE	4.32	4.32	3.77	5.48
TRANS-2-PENTENE +				
CIS-2-PENTENE +				
DICHLOROMETHANE				
2-METHYL-2-BUTENE				
3-CHLOROPROPENE				
2,2-DIMETHYLBUTANE				
4-METHYL-1-PENTENE				
3-METHYL-1-PENTENE				
CYCLOPENTANE		0.85		
2,3-DIMETHYLBUTANE				
2-METHYLPENTANE				1.08
3-METHYLPENTANE				
1-HEXENE				
CIS-1,2-DICHLOROETHENE				
2-CHLOROBUTANE				
HEXANE		0.76	0.97	1.07
TRICHLOROMETHANE	10.47	14.58	14.60	13.73
TRANS-3-HEXENE				
3-CHLORO-2-METHYLPROPENE	8.00			
METHYLCYCLOPENTANE				
1,2-DICHLOROETHANE				
1,1,1-TRICHLOROETHANE				
1-CHLOROBUTANE				
BENZENE	11.99	12.78	5.32	13.08
TETRACHLOROMETHANE				
CYCLOHEXANE				
2,3-DIMETHYLPENTANE +				
2-METHYLHEXANE +				
CYCLOHEPTENE				
3-METHYLHEXANE				
1,2-DICHLOROPROPANE				
2,3-DICHLOROPROPENE				
TRICHLOROETHENE				
2,2,4-TRIMETHYLPENTANE				

1-HEPTENE				
HEPTANE				
1-CHLORO-3-METHYLBUTANE				
TRANS-2-HEPTENE				
METHYLCYCLOHEXANE				
4-METHYLCYCLOHEXENE				
2,5-DIMETHYLHEXANE				
1-CHLOROPENTANE				
1,1,2-TRICHLOROETHANE				
TOLUENE	1.95	2.90	2.51	2.43
1,3-DICHLOROPROPANE				
2-METHYLHEPTANE				
4-METHYLHEPTANE				
3-METHYLHEPTANE				
1,2-DIBROMOETHANE				
1-OCTENE				
TRANS12DIMETHYLCYCLOHEXAN				
TRANS-4-OCTENE				
TETRACHLOROETHENE				
2-METHYL-1-HEPTENE				
OCTANE				
2-OCTENE				
CIS12DIMETHYLCYCLOHEXAN				
CHLOROBENZENE				
ETHYLCYCLOHEXANE *				
PROPYLCYCLOPENTANE *				
1-CHLOROHEXANE				
ETHYLBENZENE	0.20	0.15	0.25	0.29
m/p-XYLENE	1.05	0.98	1.32	3.57
4-METHYLOCTANE				
2-METHYLOCTANE				
STYRENE				
1,4-DICHLOROBUTANE				
O-XYLENE	0.33	0.41	0.46	1.17
1,1,2,2-TETRACHLOROETHANE				
1,2,3-TRICHLOROPROPANE				
1-NONENE				
NONANE				
ISOPROPYLBENZENE				
2-CHLOROTOLUENE				
3-CHLOROTOLUENE				
PROPYLBENZENE				
4-CHLOROTOLUENE				
3-ETHYLTOLUENE				
4-ETHYLTOLUENE				
1,3,5-TRIMETHYLBENZENE				
2-ETHYLTOLUENE				
tert-BUTYLBENZENE *				
1,2,4-TRIMETHYLBENZENE *				
1,3-DICHLOROBENZENE				
1-DECENE				
(CHLOROMETHYL)BENZENE				
1,5-DICHLOROPENTANE				
DECANE				
sec-BUTYLBENZENE				
3-(CHLOROMETHYL)HEPTANE				
1,2,3-TRIMETHYLBENZENE				
1ISOPROPYL4METHYLBENZENE	25.06	25.54	18.64	24.07
1,2-DICHLOROBENZENE				
INDAN				
BUTYLCYCLOHEXANE				
1,3-DIETHYLBENZENE				
1,4-DIETHYLBENZENE *				
BUTYLBENZENE *				
1,2-DIETHYLBENZENE				
UNDECANE				

DECAHYDRONAPTHALENE
1235-TETRAMETHYLBENZENE
1234-TETRAMETHYLBENZENE
1234-TETRAHYDRONAPTHALENE
1,4-DIISOPROPYLBENZENE
DODECANE

Total compounds identified	10.00	12.00	10.00	12.00
Total # of peaks	34.00	25.00	23.00	22.00
Total area of peaks	2911.14	3150.23	2067.25	1359.10
Area of identified peaks	1463.37	2201.78	1522.93	882.75
Area % identified peaks	50.27	69.89	73.67	64.95
Total hydrocarbons ug/m3:	124.29	135.87	52.49	79.00
Alkanes ug/m3	60.92	72.09	5.62	15.18
Cycloalkanes ug/m3	0.00	0.85	0.00	0.00
Alkenes ug/m3	4.32	5.59	3.77	5.46
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00
Aromatics ug/m3	40.58	42.76	28.50	44.61
Chlorinated alkanes ug/m3	10.47	14.58	14.60	13.73
Chlorinated alkenes ug/m3	8.00	0.00	0.00	0.00
Chlorinated aromatics ug/m3	0.00	0.00	0.00	0.00
Toluene:Ethylbenzene	9.75	19.33	10.04	8.38
Benzene:Ethylbenzene	59.95	85.20	21.28	45.10
Xylenes:Ethylbenzene	6.90	9.27	7.12	16.34
Ethylbenzene:Ethylbenzene	1.00	1.00	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 10,1985

MONITORING PERIOD	101B	103B	104B	105B	106B	106B	107B	108B
Site	10	12	13	14-L	15-L	15-L	16	17
TIME	1006-1106	1204-1304	1314-1414	1451-1506	1600-1615	1636-1651	1730-1800	1818-1848
PROPANE		1.21	2.15	0.86	27.01		5.10	9.24
PROPADIENE								
PROPYNE								
CHLOROMETHANE								
CYCLOPROPANE								
2-METHYLPROPANE								
CHLOROETHENE								
1-BUTENE								
1,3-BUTADIENE								
BUTANE	1.09	34.49	9.56	0.96	5.58		159.84	311.49
1-BUTYNE								
CHLOROETHANE								
3-METHYL-1-BUTENE							1.05	
2-METHYLBUTANE	1.22	21.93	3.61	1.01	4.72	1.30	113.10	193.90
1-PENTENE		0.68					3.09	5.94
PENTANE	1.28	12.55	2.37		0.80		66.46	110.76
2-METHYL-1,3-BUTADIENE	2.27	2.79	2.94	3.10			3.65	4.04
TRANS-2-PENTENE		1.05					4.17	7.78
cis-2-PENTENE		1.43					7.48	13.37
DICHLOROMETHANE								
2-METHYL-2-BUTENE		4.29	1.15				25.80	43.96
3-CHLOROPROPENE								
2,2-DIMETHYLBUTANE							1.37	2.67
4-METHYL-1-PENTENE								
3-METHYL-1-PENTENE								2.34
CYCLOPENTANE		0.81					4.99	8.23
2,3-DIMETHYLBUTANE		0.80					4.90	8.36
2-METHYLPENTANE	0.47	3.27	0.89				20.65	34.98
3-METHYLPENTANE		1.96	0.70				12.44	20.66
1-HEXENE								1.66
cis-1,2-DICHLOROETHENE								
2-CHLOROBUTANE								
HEXANE	1.48	3.03	1.44				17.27	27.74
TRICHLOROMETHANE	5.19	24.09	12.23	39.34	733.45	963.64	52.77	27.87
TRANS-3-HEXENE								1.67
3-CHLORO-2-METHYLPROPENE				29.38			11.14	16.67
METHYLCYCLOPENTANE	0.33	1.38	0.39			4.82	9.72	15.20
1,2-DICHLOROETHANE								
1,1,1-TRICHLOROETHANE								
1-CHLOROBUTANE								
BENZENE	4.48	4.48	7.64	9.92	46.56	18.72	13.01	22.52
TETRACHLOROMETHANE								
CYCLOHEXANE							2.28	3.38
2,3-DIMETHYLPENTANE *	0.47	1.51	0.57				12.27	17.12
2-METHYLHEXANE *	0.50	1.60	0.61				12.99	18.13
CYCLOHEXENE								
3-METHYLHEXANE		0.55					4.80	6.69
1,2-DICHLOROPROPANE								
2,3-DICHLOROPROPENE								
TRICHLOROETHENE							2.84	3.80
2,2,4-TRIMETHYLPENTANE	0.47	1.17	0.46				9.55	12.65

1-HEPTENE								
HEPTANE	0.84	0.56	0.32				3.94	5.23
1-CHLORO-3-METHYLBUTANE								
TRANS-2-HEPTENE								
METHYLCYCLOHEXANE		0.30					2.90	3.73
4-METHYLCYCLOHEXENE								
2,5-DIMETHYLHEXANE							0.82	1.01
1-CHLOROPENTANE								
1,1,2-TRICHLOROETHANE								
TOLUENE	1.42	2.71	2.75	3.60	14.54	10.90	14.69	16.70
1,3-DICHLOROPROPANE								
2-METHYLHEPTANE							1.63	1.83
4-METHYLHEPTANE								0.66
3-METHYLHEPTANE							1.64	1.87
1,2-DIBROMOETHANE								
1-OCTENE								
TRANS12DIMETHYLCYCLOHEXAN								
TRANS-4-OCTENE								
TETRACHLOROETHENE								
OCTANE	0.72	0.30					1.26	1.33
2-METHYL-1-HEPTENE								
2-OCTENE								
CIS12DIMETHYLCYCLOHEXANE								
CHLOROBENZENE								
ETHYLCYCLOHEXANE +								
PROPYLCYCLOPENTANE +								
1-CHLOROHEXANE								
ETHYLBENZENE	0.16	0.37	0.18	0.21	0.30	0.25	2.22	2.18
M-XYLENE	1.51	1.64	0.58	3.21	5.14	7.30	10.16	8.62
4-METHYLOCTANE								
2-METHYLOCTANE								
STYRENE								
1,4-DICHLOROBUTANE								
O-XYLENE	0.49	0.52		0.94		2.36	3.00	2.54
1,1,2,2-TETRACHLOROETHANE								
1,2,3-TRICHLOROPROPANE								
1-NONENE								
NONANE	0.68	0.31					0.96	0.75
ISOPROPYLBENZENE								
2-CHLOROTOLUENE								
3-CHLOROTOLUENE								
PROPYLBENZENE							0.91	
4-CHLOROTOLUENE								
3-ETHYLTOLUENE	0.48	0.42				2.85	2.34	1.66
4-ETHYLTOLUENE								
1,3,5-TRIMETHYLBENZENE					3.98	4.10	1.83	1.43
2-ETHYLTOLUENE							1.23	0.84
tert-BUTYLBENZENE +	0.74	0.54					1.66	
1,2,4-TRIMETHYLBENZENE +					13.56			
1,3-DICHLOROBENZENE								
1-DECENE								
(CHLOROMETHYL)BENZENE								
1,5-DICHLOROPENTANE								
DECANE	0.45	0.54			10.68		1.50	1.02
SEC-BUTYLBENZENE								
3-(CHLOROMETHYL)HEPTANE								
1,2,3-TRIMETHYLBENZENE						10.47	1.90	2.04
1ISOPROPYL4METHYLBENZENE	5.39	35.13	40.10	55.77	875.45	676.95	92.37	106.42
1,2-DICHLOROBENZENE								
INDAN								
BUTYLCYLCLOHEXANE								
1,3-DIETHYLBENZENE								
1,4-DIETHYLBENZENE +								
BUTYLBENZENE +								
1,2-DIETHYLBENZENE								
UNDECANE	1.32				7.44			

DECAHYDRONAPHTHALENE	2.12							
1235-TETRAMETHYLBENZENE								
1234-TETRAMETHYLBENZENE								
1234-TETRAHYDRONAPTHALENE								
1,4-DIISOPROPYLBENZENE								
DODECANE	0.56						0.98	
Total Compounds Identified	25.00	33.00	19.00	8.00	13.00	20.00	46.00	46.00
Total # of Peaks	34.00	49.00	35.00	15.00	49.00	54.00	82.00	75.00
Total Area of Peaks	1920.58	6488.20	3957.58	1146.73	8101.69	9962.77	15805.35	23327.16
Area of Identified Peaks	1316.95	5357.89	3008.24	831.13	5069.81	7330.47	12311.10	19247.13
Area % Identified Peaks	68.57	82.58	76.01	72.48	62.58	73.58	77.89	82.51
Total hydrocarbons ug/m3:	36.13	168.37	90.64	148.24	1751.21	1703.66	730.63	1112.68
Alkanes ug/m3	10.83	85.52	22.68	2.77	56.23	1.30	452.21	786.76
Cycloalkanes ug/m3	0.33	2.49	0.39	0.00	0.00	4.82	19.89	30.54
Alkenes ug/m3	2.99	10.46	4.09	3.10	0.00	0.00	46.50	82.09
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aromatics ug/m3	16.79	45.81	51.25	73.65	961.53	733.90	145.28	164.95
Chlorinated alkanes ug/m3	5.19	24.09	12.23	39.34	733.45	963.64	52.77	27.87
Chlorinated alkenes ug/m3	0.00	0.00	0.00	29.38	0.00	0.00	13.98	20.47
Chlorinated aromatics ug/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toluene:Ethylbenzene	8.88	7.32	15.28	17.14	48.47	43.60	6.62	7.66
Benzene:Ethylbenzene	28.00	12.11	42.44	47.24	161.87	74.88	5.86	10.33
Xylenes:Ethylbenzene	12.50	5.84	3.22	19.76	17.13	38.64	5.90	5.12
Ethylbenzene:Ethylbenzene	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 11,1985

MONITORING PERIOD	111B	112B	113B	113B
Site	18	19	20	20
TIME	1145-1245	1348-1448	1521-1605	1616-1646
PROPANE	3.40	4.50	18.02	62.46
PROPADIENE				
PROPYNE				
CHLOROMETHANE			2.70	
CYCLOPROPANE				
2-METHYLPROPANE	14.41	13.27	48.83	113.09
CHLOROETHENE				
1-BUTENE			4.86	
1,3-BUTADIENE		3.65		
BUTANE	120.44	103.05	193.19	912.78
1-BUTYNE				
CHLOROETHANE				
3-METHYL-1-BUTENE				
2-METHYLBUTANE	73.23	64.91	314.82	368.35
1-PENTENE	1.82	1.63	8.01	9.88
PENTANE	45.11	36.07	189.02	208.18
2-METHYL-1,3-BUTADIENE	3.41		4.10	3.52
TRANS-2-PENTENE +	3.21	3.21	13.68	14.55
CIS-2-PENTENE +	5.43	6.26	23.89	25.59
DICHLOROMETHANE				
2-METHYL-2-BUTENE	16.30	17.71	79.99	65.49
3-CHLOROPROPENE				
2,2-DIMETHYLBUTANE	0.98		3.22	4.09
4-METHYL-1-PENTENE				
3-METHYL-1-PENTENE	0.78		3.67	3.95
CYCLOPENTANE	3.30	3.80	14.37	16.62
2,3-DIMETHYLBUTANE	3.26	3.67	14.78	16.85
2-METHYLPENTANE	12.78	14.53	58.12	66.78
3-METHYLPENTANE	7.53	8.77	34.81	39.49
1-HEXENE			1.86	3.37
CIS-1,2-DICHLOROETHENE				
2-CHLOROBUTANE				
HEXANE	10.62	12.51	48.78	56.43
TRICHLOROMETHANE		39.75		13.99
TRANS-3-HEXENE	0.71		2.62	3.29
3-CHLORO-2-METHYLPROPENE		9.07		11.11
METHYLCYCLOPENTANE	6.10	7.25	29.43	32.41
1,2-DICHLOROETHANE				
1,1,1-TRICHLOROETHANE				
1-CHLOROBUTANE				
BENZENE	6.56	9.84	28.90	68.41
TETRACHLOROMETHANE				
CYCLOHEXANE	1.44	1.78	6.53	9.42
2,3-DIMETHYLPENTANE +	7.35	10.04	39.96	47.90
2-METHYLHEXANE +	7.78	10.63	42.34	50.74
CYCLOHEXENE				
3-METHYLHEXANE	2.54	3.64	13.99	17.89
1,2-DICHLOROPROPANE				
2,3-DICHLOROPROPENE				3.79
TRICHLOROETHENE	1.61	2.28		10.61
2,2,4-TRIMETHYLPENTANE	5.98	8.27	35.99	42.94

1-HEPTENE				
HEPTANE	2.00	3.11	12.12	15.42
1-CHLORO-3-METHYLBUTANE				1.53
TRANS-2-HEPTENE			1.25	1.59
METHYLCYCLOHEXANE	1.59	2.78	9.85	11.30
4-METHYLCYCLOHEXENE				
2,5-DIMETHYLHEXANE	0.44	0.71	2.95	3.62
1-CHLOROPENTANE				
1,1,2-TRICHLOROETHANE				
TOLUENE	6.62	14.54		58.99
1,3-DICHLOROPROPANE				
2-METHYLHEPTANE	0.81	1.51	5.66	7.07
4-METHYLHEPTANE			2.09	2.60
3-METHYLHEPTANE	0.80	1.49	4.66	5.76
1,2-DIBROMOETHANE				
1-OCTENE				
TRANS12DIMETHYLCYCLOHEXAN				0.88
TRANS-4-OCTENE				
TETRACHLOROETHENE				
2-METHYL-1-HEPTENE	0.59	1.19	3.53	4.32
OCTANE				
2-OCTENE				
CIS12DIMETHYLCYCLOHEXAN				1.03
CHLOROBENZENE				
ETHYLCYCLOHEXANE +				1.03
PROPYLCYCLOPENTANE +				1.91
1-CHLOROHEXANE				
ETHYLBENZENE	1.00	3.15	5.98	7.39
m/p-XYLENE	4.42	14.23	30.63	33.24
4-METHYLOCTANE				
2-METHYLOCTANE			2.66	2.94
STYRENE				
1,4-DICHLOROBUTANE				
O-XYLENE	1.36	3.29	7.40	8.17
1,1,2,2-TETRACHLOROETHANE				
1,2,3-TRICHLOROPROPANE				
1-NONENE				
NONANE	0.38	1.08	2.55	2.82
ISOPROPYLBENZENE				0.70
2-CHLOROTOLUENE			1.55	1.20
3-CHLOROTOLUENE				
PROPYLBENZENE	0.42	0.99	2.37	2.70
4-CHLOROTOLUENE			2.06	2.61
3-ETHYLTOLUENE	1.39	3.33	7.91	8.59
4-ETHYLTOLUENE				
1,3,5-TRIMETHYLBENZENE	0.83	3.47	7.00	6.69
2-ETHYLTOLUENE	0.48		3.44	3.82
tert-BUTYLBENZENE +		3.55	2.41	3.29
1,2,4-TRIMETHYLBENZENE +				
1,3-DICHLOROBENZENE				
1-DECENE				
(CHLOROMETHYL)BENZENE				
1,5-DICHLOROPENTANE				
DECANE		2.68	1.82	2.48
sec-BUTYLBENZENE				
3-(CHLOROMETHYL)HEPTANE				
1,2,3-TRIMETHYLBENZENE	0.59	3.17	5.73	
1ISOPROPYL4METHYLBENZENE	5.51	215.74	182.17	519.58
1,2-DICHLOROBENZENE		2.07	4.51	
INDAN		2.32	5.05	
BUTYLCYCLOHEXANE				
1,3-DIETHYLBENZENE				1.92
1,4-DIETHYLBENZENE +			1.61	2.40
BUTYLBENZENE +				
1,2-DIETHYLBENZENE				
UNDECANE				

DECAHYDRONAPTHALENE				
1235-TETRAMETHYLBENZENE			3.12	
1234-TETRAMETHYLBENZENE				
1234-TETRAHYDRONAPTHALENE		2.18		
1,4-DIISOPROPYLBENZENE				
DODECANE				
Total compounds identified	42.00	44.00	55.00	62.00
Total # of peaks	68.00	91.00	116.00	138.00
Total area of peaks	16563.42	19031.75	32149.20	67517.46
Area of identified peaks	13529.52	14181.06	23486.24	55837.44
Area % identified peaks	81.68	74.50	73.05	82.70
Total hydrocarbons ug/m3:	395.31	684.49	1601.64	3034.68
Alkanes ug/m3	319.84	304.44	1090.38	2050.68
Cycloalkanes ug/m3	12.43	15.61	60.18	74.60
Alkenes ug/m3	32.25	33.65	147.48	135.55
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00
Aromatics ug/m3	29.18	277.62	292.78	729.01
Chlorinated alkanes ug/m3	0.00	39.75	2.70	15.52
Chlorinated alkenes ug/m3	1.61	11.35	0.00	25.51
Chlorinated aromatics ug/m3	0.00	2.07	8.12	3.81
Toluene:Ethylbenzene	6.62	4.62	0.00	7.98
Benzene:Ethylbenzene	6.56	3.12	4.83	9.26
Xylenes:Ethylbenzene	5.78	5.56	6.36	5.60
Ethylbenzene:Ethylbenzene	1.00	1.00	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 12,1985

MONITORING PERIOD	122B	123B	123B	123B
Site	21	22	22	22
TIME	1012-1112	1124-1154	1203-1243	1303-1333
ETHANE				
PROPANE	40.62	7.75	17.04	60.27
PROPADIENE				
PROPYNE				
CHLOROMETHANE				
CYCLOPROPANE				
2-METHYLPROPANE				
CHLOROETHENE				
1-BUTENE	15.67			
1,3-BUTADIENE	10.22		2.86	7.97
BUTANE	223.65	269.91	586.03	1227.50
1-BUTYNE				
CHLOROETHANE				
3-METHYL-1-BUTENE			2.98	4.17
2-METHYLBUTANE	191.32	193.56	329.16	532.99
1-PENTENE	5.67	4.37	7.98	12.48
PENTANE	114.07	122.98	188.13	302.44
2-METHYL-1,3-BUTADIENE	5.01	3.74	4.21	6.37
TRANS-2-PENTENE *	9.20	7.58	13.22	21.18
CIS-2-PENTENE *	15.25	13.78	23.20	37.74
DICHLOROMETHANE				
2-METHYL-2-BUTENE	52.60	41.22	74.68	115.62
3-CHLOROPROPENE				
2,2-DIMETHYLBUTANE	2.91	3.05	3.38	6.54
4-METHYL-1-PENTENE				
3-METHYL-1-PENTENE	3.10		3.30	5.07
CYCLOPENTANE	11.88	7.57	12.75	20.61
2,3-DIMETHYLBUTANE	13.03	7.97	13.38	20.73
2-METHYLPENTANE	54.64	31.34	53.48	80.26
3-METHYLPENTANE	33.85	19.03	31.77	46.97
1-HEXENE	3.05		1.80	3.19
CIS-1,2-DICHLOROETHENE				
2-CHLOROBUTANE				
HEXANE	51.28	26.44	44.68	62.68
TRICHLOROMETHANE	20.85	16.65	50.41	41.99
TRANS-3-HEXENE	2.81	1.44	2.55	3.68
3-CHLORO-2-METHYLPROPENE	16.73		33.19	45.37
METHYLCYCLOPENTANE	31.41	15.38	26.30	35.32
1,2-DICHLOROETHANE				
1,1,1-TRICHLOROETHANE				
1-CHLOROBUTANE				
BENZENE	40.37	23.39	32.26	40.65
TETRACHLOROMETHANE				
CYCLOHEXANE	9.83	3.27	5.83	7.22
2,3-DIMETHYLPENTANE *	52.57	21.33	37.87	46.34
2-METHYLHEXANE *	55.69	22.60	40.12	49.10
CYCLOHEXENE	2.40			
3-METHYLHEXANE	19.88	7.66	13.82	16.75
1,2-DICHLOROPROPANE				
2,3-DICHLOROPROPENE	2.30			
TRICHLOROETHENE	12.35		8.83	10.66
2,2,4-TRIMETHYLPENTANE	50.39	18.83	34.96	39.95

1-HEPTENE				
HEPTANE	19.11	6.49	11.54	14.15
1-CHLORO-3-METHYLBUTANE	1.29			
TRANS-2-HEPTENE	2.01			
METHYLCYCLOHEXANE	14.61	4.81	9.43	10.65
4-METHYLCYCLOHEXENE				
2,5-DIMETHYLHEXANE	4.68	1.51	2.96	3.24
1-CHLORPENTANE				
1,1,2-TRICHLORDETHANE				
TOLUENE	73.04	28.00	48.46	51.98
1,3-DICHLORDPROPANE				
2-METHYLHEPTANE	9.66	2.77	5.83	6.13
4-METHYLHEPTANE	3.47	1.02	2.15	2.25
3-METHYLHEPTANE	8.08	2.77	5.05	5.05
1,2-DIBROMOETHANE				
1-OCTENE	2.03			
TRANS12DIMETHYLCYCLOHEXAN	1.44			
TRANS-4-OCTENE				
TETRACHLOROETHENE				
2-METHYL-1-HEPTENE	6.42	2.07	3.87	3.79
OCTANE				
2-OCTENE				
CIS12DIMETHYLCYCLOHEXAN	1.58			
CHLOROBENZENE				
ETHYLCYCLOHEXANE +	1.69			
PROPYLCYCLOPENTANE +	3.13			
1-CHLOROHEXANE				
ETHYLBENZENE	10.82	3.29	7.04	6.46
m/p-XYLENE	51.15	14.81	32.99	30.17
4-METHYLOCTANE			3.73	3.94
2-METHYLOCTANE	4.65		2.60	2.21
STYRENE				
1,4-DICHLOROBUTANE				
O-XYLENE	12.54	3.47	8.26	7.04
1,1,2,2-TETRACHLOROETHANE				
1,2,3-TRICHLOROPROPANE				
1-NONENE				
NONANE	6.14	2.02	3.77	3.26
ISOPROPYLBENZENE	0.95			
2-CHLOROTOLUENE	1.63			
3-CHLOROTOLUENE				
PROPYLBENZENE	5.11	1.15	2.80	2.01
4-CHLOROTOLUENE	5.15	1.96	2.84	4.11
3-ETHYLTOLUENE	12.69	3.92	9.11	7.78
4-ETHYLTOLUENE				
1,3,5-TRIMETHYLBENZENE	10.97	4.99	9.09	6.90
2-ETHYLTOLUENE				
tert-BUTYLBENZENE +	18.44			
1,2,4-TRIMETHYLBENZENE +	15.29	8.95	13.95	13.61
1,3-DICHLOROBENZENE				
1-DECENE				
(CHLOROMETHYL)BENZENE				
1,5-DICHLOROPENTANE	24.82	15.15	24.84	25.64
DECANE	11.98	9.06	11.70	9.34
sec-BUTYLBENZENE				
3-(CHLOROMETHYL)HEPTANE				
1,2,3-TRIMETHYLBENZENE	10.32	3.85	9.25	10.32
1ISOPROPYL4METHYLBENZENE	108.70	428.01	262.98	335.11
1,2-DICHLOROBENZENE				
INDAN	5.17			
BUTYLCYCLOHEXANE				
1,3-DIETHYLBENZENE				
1,4-DIETHYLBENZENE +	9.06	6.36		
BUTYLBENZENE +				
1,2-DIETHYLBENZENE	2.16			
UNDECANE	19.58	17.90	18.53	16.15

DECAHYDRONAPTHALENE				
1235-TETRAMETHYLBENZENE			16.87	13.60
1234-TETRAMETHYLBENZENE			11.12	12.39
1234-TETRAHYDRONAPTHALENE	12.17	11.79	10.87	12.11
1,4-DIISOPROPYLBENZENE			7.93	11.34
DODECANE	6.49	12.15	10.44	12.68

Total compounds identified	70.00	49.00	59.00	58.00
Total # of peaks	188.00	137.00	159.00	138.00
Total area of peaks	57965.56	30949.79	43520.89	42988.63
Area of identified peaks	31796.47	18022.38	26548.68	30356.56
Area % identified peaks	54.85	58.23	61.00	70.62
Total hydrocarbons ug/m3:	1692.02	1489.11	2270.17	3555.22
Alkanes ug/m3	997.74	808.14	1472.12	2570.92
Cycloalkanes ug/m3	75.57	31.03	54.31	73.80
Alkenes ug/m3	133.04	74.20	140.65	221.26
Cycloalkenes ug/m3	2.40	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00
Aromatics ug/m3	398.95	541.95	482.98	561.47
Chlorinated alkanes ug/m3	46.16	31.80	75.25	67.63
Chlorinated alkenes ug/m3	31.38	0.00	42.02	56.03
Chlorinated aromatics ug/m3	6.78	1.96	2.84	4.11
Toluene:Ethylbenzene	6.75	8.51	6.88	8.05
Benzene:Ethylbenzene	3.73	7.11	4.58	6.29
Xylenes:Ethylbenzene	5.89	5.56	5.86	5.76
Ethylbenzene:Ethylbenzene	1.00	1.00	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 13,1985

MONITORING PERIOD	131B	131B	132B
Site	24	24	25
TIME	1124-1144	1217-1237	1317-1337
PROPANE			6.50
PROPADIENE			
PROPYNE			
CHLOROMETHANE			
CYCLOPROPANE			
2-METHYLPROPANE			
CHLOROETHENE			
1-BUTENE			
1,3-BUTADIENE	3.77		
BUTANE	8.05		4.80
1-BUTYNE			
CHLOROETHANE			
3-METHYL-1-BUTENE			
2-METHYLBUTANE	61.93		
1-PENTENE			
PENTANE	77.79		19.71
2-METHYL-1,3-BUTADIENE			4.16
TRANS-2-PENTENE *			2.45
CIS-2-PENTENE *			4.31
DICHLOROMETHANE			
2-METHYL-2-BUTENE			14.96
3-CHLOROPROPENE			
2,2-DIMETHYLBUTANE			
4-METHYL-1-PENTENE			
3-METHYL-1-PENTENE			
CYCLOPENTANE			
2,3-DIMETHYLBUTANE			2.64
2-METHYLPENTANE			8.57
3-METHYLPENTANE		4.25	6.09
1-HEXENE			
CIS-1,2-DICHLOROETHENE			
2-CHLOROBUTANE			
HEXANE		6.65	7.23
TRICHLOROMETHANE			54.09
TRANS-3-HEXENE			
3-CHLORO-2-METHYLPROPENE			
METHYLCYCLOPENTANE		3.56	4.24
1,2-DICHLOROETHANE			
1,1,1-TRICHLOROETHANE			
1-CHLOROBUTANE			
BENZENE	17.89	28.05	15.30
TETRACHLOROMETHANE			
CYCLOHEXANE			
2,3-DIMETHYLPENTANE *		10.50	8.05
2-METHYLHEXANE *		11.12	6.52
CYCLOHEXENE			
3-METHYLHEXANE		4.86	2.41
1,2-DICHLOROPROPANE			
2,3-DICHLOROPROPENE			
TRICHLOROETHENE			
2,2,4-TRIMETHYLPENTANE		11.88	8.49

1-HEPTENE	6.75	2.31	
HEPTANE			
1-CHLORO-3-METHYLBUTANE			
TRANS-2-HEPTENE	2.54		
METHYLCYCLOHEXANE			
4-METHYLCYCLOHEIENE			
2,5-DIMETHYLHEXANE			
1-CHLOROPENTANE			
1,1,2-TRICHLOROETHANE			
TOLUENE	5.34	19.77	12.67
1,3-DICHLOROPROPANE			
2-METHYLHEPTANE	2.05		
4-METHYLHEPTANE			
3-METHYLHEPTANE	1.83		
1,2-DIBROMOETHANE			
1-OCTENE			
TRANS12DIMETHYLCYCLOHEXAN			
TRANS-4-OCTENE			
TETRACHLOROETHENE			
2-METHYL-1-HEPTENE	2.43	1.52	
OCTANE			
2-OCTENE			
CIS12DIMETHYLCYCLOHEXAN			
CHLOROBENZENE			
ETHYLCYCLOHEXANE +			
PROPYLCYCLOPENTANE +			
1-CHLOROHEXANE			
ETHYLBENZENE	2.86	2.75	2.33
m/p-XYLENE	24.78	9.43	10.72
4-METHYLOCTANE			
2-METHYLOCTANE	2.57		
STYRENE			
1,4-DICHLOROBUTANE			
O-XYLENE	6.51	2.17	2.68
1,1,2,2-TETRACHLOROETHANE			
1,2,3-TRICHLOROPROPANE			
1-NONENE			
NONANE	5.54		
ISOPROPYLBENZENE			
2-CHLOROTOLUENE	2.80		
3-CHLOROTOLUENE			
PROPYLBENZENE	3.07		
4-CHLOROTOLUENE	6.28		
3-ETHYLTOLUENE	9.20	2.48	3.88
4-ETHYLTOLUENE			
1,3,5-TRIMETHYLBENZENE	11.41	4.17	
2-ETHYLTOLUENE			
tert-BUTYLBENZENE +			
1,2,4-TRIMETHYLBENZENE +	13.27		
1,3-DICHLOROBENZENE			
1-DECENE			
(CHLOROMETHYL)BENZENE			
1,5-DICHLOROPENTANE			
DECANE	14.46	7.27	
sec-BUTYLBENZENE			
3-(CHLOROMETHYL)HEPTANE			
1,2,3-TRIMETHYLBENZENE	9.17	7.53	6.32
1ISOPROPYL4METHYLBENZENE	312.97	446.55	219.99
1,2-DICHLOROBENZENE			
INDAN			
BUTYLCYCLOHEXANE			
1,3-DIETHYLBENZENE			
1,4-DIETHYLBENZENE +			
BUTYLBENZENE +			
1,2-DIETHYLBENZENE			
UNDECANE	14.31	11.95	

DECAHYDRONAPTHALENE			
1235-TETRAMETHYLBENZENE	8.41		
1234-TETRAMETHYLBENZENE	10.96	10.02	8.88
1234-TETRAHYDRONAPTHALENE	10.71	9.79	10.43
1,4-DIISOPROPYLBENZENE			
DODECANE	8.55	8.96	7.32

Total compounds identified	26.00	26.00	29.00
Total # of peaks	79.00	75.00	75.00
Total area of peaks	10147.72	7842.62	7475.96
Area of identified peaks	4277.62	4128.89	2613.02
Area % identified peaks	42.15	52.65	34.95
Total hydrocarbons ug/m3:	654.97	638.40	470.05
Alkanes ug/m3	193.14	88.07	92.64
Cycloalkanes ug/m3	0.00	6.10	4.24
Alkenes ug/m3	6.20	1.52	25.88
Cycloalkenes ug/m3	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00
Aromatics ug/m3	446.55	542.71	293.20
Chlorinated alkanes ug/m3	0.00	0.00	54.09
Chlorinated alkenes ug/m3	0.00	0.00	0.00
Chlorinated aromatics ug/m3	9.08	0.00	0.00
Toluene:Ethylbenzene	1.87	7.19	5.44
Benzene:Ethylbenzene	6.26	10.20	6.57
Xylenes:Ethylbenzene	10.94	4.22	5.75
Ethylbenzene:Ethylbenzene	1.00	1.00	1.00

FORT FRANCES SURVEY-85

MAMU#2
JULY 14,1985

MONITORING PERIOD	1418	1418
Site	26-L	26-L
TIME	1506-1516	1506-1516
PROPANE	2.59	31.32
PROPADIENE		
PROPYNE		
CHLOROMETHANE		
CYCLOPROPANE		
2-METHYLPROPANE		
CHLOROETHENE		
1-BUTENE		
1,3-BUTADIENE		
BUTANE	1.89	3.04
1-BUTYNE		
CHLOROETHANE		
3-METHYL-1-BUTENE		
2-METHYLBUTANE	15.68	
1-PENTENE		3.10
PENTANE	14.50	
2-METHYL-1,3-BUTADIENE		
TRANS-2-PENTENE +		3.28
CIS-2-PENTENE +		5.95
DICHLOROMETHANE		
2-METHYL-2-BUTENE		8.02
3-CHLOROPROPENE		
2,2-DIMETHYLBUTANE		
4-METHYL-1-PENTENE		
3-METHYL-1-PENTENE		
CYCLOPENTANE		
2,3-DIMETHYLBUTANE		
2-METHYLPENTANE		
3-METHYLPENTANE		
1-HEXENE		
CIS-1,2-DICHLOROETHENE		
2-CHLOROBUTANE		
HEXANE		
TRICHLOROMETHANE	522.39	327.72
TRANS-3-HEXENE		
3-CHLORO-2-METHYLPROPENE		
METHYLCYCLOPENTANE		
1,2-DICHLOROETHANE		
1,1,1-TRICHLOROETHANE		
1-CHLOROBUTANE		
BENZENE	17.36	4.29
TETRACHLOROMETHANE		
CYCLOHEXANE		
2,3-DIMETHYLPENTANE +		
2-METHYLHEXANE +		
CYCLOHEXENE		
3-METHYLHEXANE		
1,2-DICHLOROPROPANE		
2,3-DICHLOROPROPENE		
TRICHLOROETHENE		
2,2,4-TRIMETHYLPENTANE		4.26

1-HEPTENE		
HEPTANE		
1-CHLORO-3-METHYLBUTANE		
TRANS-2-HEPTENE		2.42
METHYLCYCLOHEXANE		
4-METHYLCYCLOHEIENE		
2,5-DIMETHYLHEXANE		
1-CHLOROPENTANE		
1,1,2-TRICHLOROETHANE		
TOLUENE	4.63	6.07
1,3-DICHLOROPROPANE		
2-METHYLHEPTANE		
4-METHYLHEPTANE		
3-METHYLHEPTANE		
1,2-DIBROMOETHANE		
1-OCTENE		
TRANSI2DIMETHYLCYCLOHEXAN		
TRANS-4-OCTENE		
TETRACHLOROETHENE		
2-METHYL-1-HEPTENE		
OCTANE		
2-OCTENE		
CIS12DIMETHYLCYCLOHEXAN		
CHLOROBENZENE		
ETHYLCYCLOHEXANE +		
PROPYLCYCLOPENTANE +		
1-CHLOROHEXANE		
ETHYLBENZENE		
m/p-XYLENE	5.59	2.72
4-METHYLOCTANE		
2-METHYLOCTANE		
STYRENE		
1,4-DICHLOROBUTANE		
O-XYLENE	1.76	
1,1,2,2-TETRACHLOROETHANE		
1,2,3-TRICHLOROPROPANE		
1-NONENE		
NONANE		
ISOPROPYLBENZENE		
2-CHLOROTOLUENE		
3-CHLOROTOLUENE		
PROPYLBENZENE		
4-CHLOROTOLUENE		
3-ETHYLTOLUENE	1.99	
4-ETHYLTOLUENE		
1,3,5-TRIMETHYLBENZENE	3.87	2.23
2-ETHYLTOLUENE		
tert-BUTYLBENZENE +	8.71	
1,2,4-TRIMETHYLBENZENE +		
1,3-DICHLOROBENZENE		
1-DECENE		
(CHLOROMETHYL)BENZENE		
1,5-DICHLOROPENTANE		
DECANE	5.26	
sec-BUTYLBENZENE		
3-(CHLOROMETHYL)HEPTANE		
1,2,3-TRIMETHYLBENZENE		
1ISOPROPYL4METHYLBENZENE	128.99	144.49
1,2-DICHLOROBENZENE		
INDAN		
BUTYLCYCLOHEXANE		
1,3-DIETHYLBENZENE		
1,4-DIETHYLBENZENE +	3.66	
BUTYLBENZENE +		
1,2-DIETHYLBENZENE		
UNDECANE		

DECAHYDRONAPTHALENE	
1235-TETRAMETHYLBENZENE	
1234-TETRAMETHYLBENZENE	9.56
1234-TETRAHYDRONAPTHALENE	9.35
1,4-DIISOPROPYLBENZENE	
DODECANE	5.33

Total compounds identified	18.00	15.00
Total # of peaks	56.00	32.00
Total area of peaks	5742.90	2627.74
Area of identified peaks	1920.93	1589.45
Area % identified peaks	33.43	60.49

Total hydrocarbons ug/m3:	763.11	548.91
Alkanes ug/m3	45.25	38.62
Cycloalkanes ug/m3	0.00	0.00
Alkenes ug/m3	0.00	22.77
Cycloalkenes ug/m3	0.00	0.00
Alkynes ug/m3	0.00	0.00
Aromatics ug/m3	195.47	159.86
Chlorinated alkanes ug/m3	522.39	327.72
Chlorinated alkenes ug/m3	0.00	0.00
Chlorinated aromatics ug/m3	0.00	0.00

Toluene:Ethylbenzene
Benzene:Ethylbenzene
Xylenes:Ethylbenzene
Ethylbenzene:Ethylbenzene

FORT FRANCES SURVEY-85

MAMU#2
JULY 15,1985

MONITORING PERIOD	1518	1518	1528	1538
Site	27-L	27-L	28-L	29-L
TIME	1001-1011	1040-1100	1124-1154	1230-1256
PROPANE	9.64	20.07	8.92	6.33
PROPADIENE				
PROPYNE				
CHLOROMETHANE				
CYCLOPROPANE				
2-METHYLPROPANE				
CHLOROETHENE				
1-BUTENE				
1,3-BUTADIENE				
BUTANE	6.14	47.37	14.26	1.94
1-BUTYNE				
CHLOROETHANE				
3-METHYL-1-BUTENE				
2-METHYLBUTANE	4.63	44.81	11.86	8.33
1-PENTENE				
PENTANE	3.61	27.90	8.35	5.91
2-METHYL-1,3-BUTADIENE			2.07	2.24
TRANS-2-PENTENE *			0.97	
CIS-2-PENTENE *		2.10	1.33	
DICHLOROMETHANE				
2-METHYL-2-BUTENE		7.04	4.15	
3-CHLOROPROPENE				
2,2-DIMETHYLBUTANE				
4-METHYL-1-PENTENE				
3-METHYL-1-PENTENE				
CYCLOPENTANE		1.57	0.81	
2,3-DIMETHYLBUTANE			0.91	
2-METHYLPENTANE		3.57	3.63	
3-METHYLPENTANE		2.44	2.47	
1-HEXENE				
CIS-1,2-DICHLOROETHENE				
2-CHLOROBUTANE				
HEXANE		3.43	3.60	
TRICHLOROMETHANE	227.11	283.07	12.10	39.79
TRANS-3-HEXENE				
3-CHLORO-2-METHYLPROPENE				
METHYLCYCLOPENTANE		1.89	2.24	
1,2-DICHLOROETHANE				
1,1,1-TRICHLOROETHANE				
1-CHLOROBUTANE				
BENZENE	22.78	42.18	8.72	19.16
TETRACHLOROMETHANE				
CYCLOHEXANE				
2,3-DIMETHYLPENTANE *		3.15	3.75	
2-METHYLHEXANE *		3.34	3.98	
CYCLOHEXENE				
3-METHYLHEXANE		1.12	1.23	
1,2-DICHLOROPROPANE				
2,3-DICHLOROPROPENE				
TRICHLOROETHENE				
2,2,4-TRIMETHYLPENTANE		2.93	4.13	

1-HEPTENE				
HEPTANE		0.95	1.26	
1-CHLORO-3-METHYLBUTANE				
TRANS-2-HEPTENE				
METHYLCYCLOHEXANE			0.96	
4-METHYLCYCLOHEIENE				
2,5-DIMETHYLHEXANE				
1-CHLOROPENTANE				
1,1,2-TRICHLOROETHANE				
TOLUENE	11.52	18.79	6.41	5.26
1,3-DICHLOROPROPANE				
2-METHYLHEPTANE			0.65	
4-METHYLHEPTANE				
3-METHYLHEPTANE			0.62	
1,2-DIBROMOETHANE				
1-OCTENE				
TRANS12DIMETHYLCYCLOHEXAN				
TRANS-4-OCTENE				
TETRACHLOROETHENE				
2-METHYL-1-HEPTENE			0.53	
OCTANE				
2-OCTENE				
CIS12DIMETHYLCYCLOHEXAN				
CHLOROBENZENE				
ETHYLCYCLOHEIANE +				
PROPYLCYCLOPENTANE +				
1-CHLOROHEXANE				
ETHYLBENZENE			0.94	
m/p-XYLENE	5.29	3.21	4.20	1.38
4-METHYLOCTANE				
2-METHYLOCTANE				
STYRENE				
1,4-DICHLOROBUTANE				
O-XYLENE			1.28	
1,1,2,2-TETRACHLOROETHANE				
1,2,3-TRICHLOROPROPANE				
1-NONENE				
NONANE				
ISOPROPYLBENZENE				
2-CHLOROTOLUENE				
3-CHLOROTOLUENE	3.07	1.88		
PROPYLBENZENE				
4-CHLOROTOLUENE		1.53		
3-ETHYLTOLUENE	3.73	2.53	1.04	
4-ETHYLTOLUENE				
1,3,5-TRIMETHYLBENZENE	11.04	7.52	1.33	
2-ETHYLTOLUENE				
tert-BUTYLBENZENE +		3.78		
1,2,4-TRIMETHYLBENZENE +				
1,3-DICHLOROBENZENE				
1-DECENE				
(CHLOROMETHYL)BENZENE				
1,5-DICHLOROPENTANE				
DECANE		2.85		
sec-BUTYLBENZENE				
3-(CHLOROMETHYL)HEPTANE				
1,2,3-TRIMETHYLBENZENE				
1ISOPROPYL4METHYLBENZENE	578.25	1184.60	21.70	73.16
1,2-DICHLOROBENZENE		4.87		
INDAN	10.85	5.46		
BUTYLCYCLOHEXANE				
1,3-DIETHYLBENZENE				
1,4-DIETHYLBENZENE +				
BUTYLBENZENE +				
1,2-DIETHYLBENZENE				
UNDECANE				

DECAHYDRONAPTHALENE				
1235-TETRAMETHYLBENZENE				
1234-TETRAMETHYLBENZENE		3.00		
1234-TETRAHYDRONAPTHALENE				
1.4-DIISOPROPYLBENZENE				
DODECANE	1.93			

Total compounds identified	14.00	29.00	32.00	10.00
Total # of peaks	47.00	77.00	47.00	38.00
Total area of peaks	6471.95	21414.15	3986.58	3094.54
Area of identified peaks	4363.36	10512.44	2507.87	1662.24
Area % identified peaks	67.42	49.09	62.88	53.72
Total hydrocarbons ug/m3:	899.59	1738.95	140.42	163.50
Alkanes ug/m3	25.95	163.93	69.64	22.51
Cycloalkanes ug/m3	0.00	3.46	4.01	0.00
Alkenes ug/m3	0.00	9.14	9.05	2.24
Cycloalkenes ug/m3	0.00	0.00	0.00	0.00
Alkynes ug/m3	0.00	0.00	0.00	0.00
Aromatics ug/m3	643.46	1271.07	45.62	98.96
Chlorinated alkanes ug/m3	227.11	283.07	12.10	39.79
Chlorinated alkenes ug/m3	0.00	0.00	0.00	0.00
Chlorinated aromatics ug/m3	3.07	8.28	0.00	0.00
Toluene:Ethylbenzene			6.82	
Benzene:Ethylbenzene			9.28	
Xylenes:Ethylbenzene			5.83	
Ethylbenzene:Ethylbenzene			1.00	

APPENDIX 2

Time - Concentration Plots

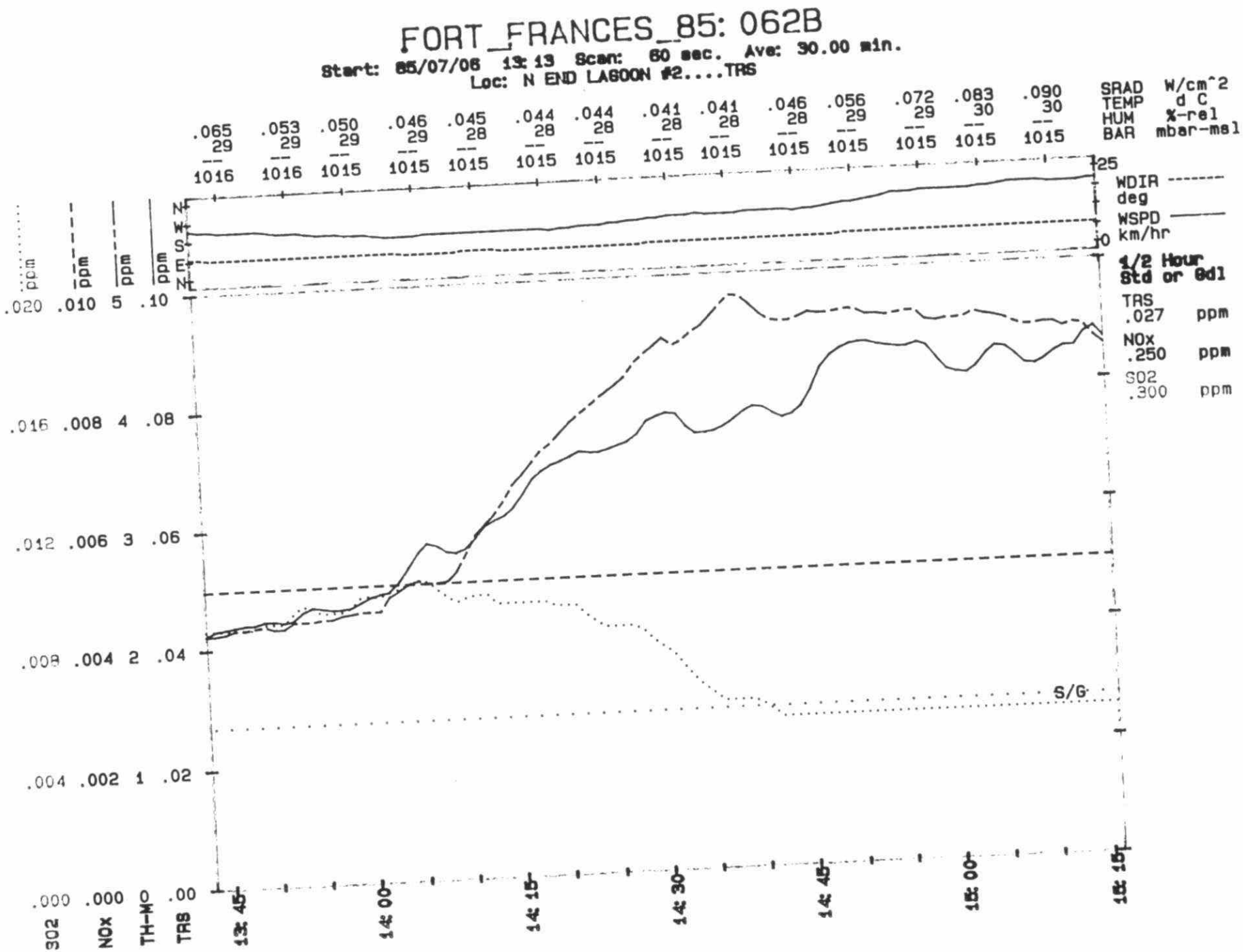
for

Total Reduced Sulphur	- TRS
Non-Methane Hydrocarbons	- TH-M
Sulphur Dioxide	- SO_2
Nitrogen Oxides	- NO_x

and

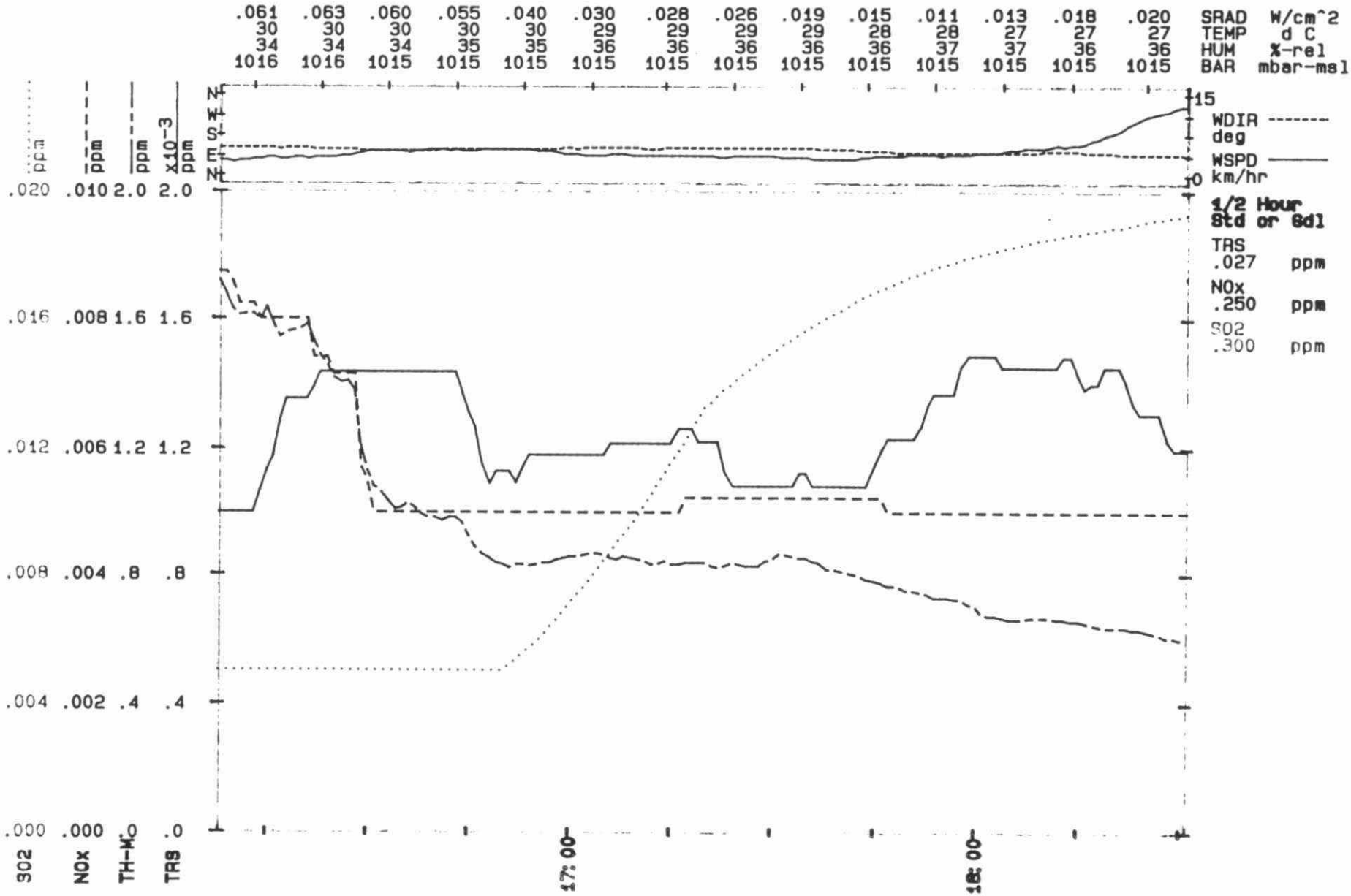
several meteorological parameters:

Solar Radiation	- SRAD
Temperature	- TEMP
Barometric Pressure	- BAR
Wind Direction	- WDIR
Wind Speed	- WSPD


FORT_FRANCES_85: 062B
Start: 85/07/06 13:13 Scan: 60 sec. Ave: 30.00 min.
Loc: N END LAGOON #2....TRS
SRAD W/cm^2
TEMP d C
HUM %-rel
BAR mbar-msl
.065 29 1016
.053 29 1016
.050 29 1015
.046 29 1015
.045 28 1015
.044 28 1015
.044 28 1015
.041 28 1015
.041 28 1015
.046 28 1015
.056 29 1015
.072 29 1015
.083 30 1015
.090 30 1015
WDIR deg
WSPD km/hr
1/2 Hour Std or Mdl
TRS .027 ppm
NOx .250 ppm
SO2 .300 ppm
S/G
.020 .010 5 .10
.016 .008 4 .08
.012 .006 3 .06
.008 .004 2 .04
.004 .002 1 .02
.000 .000 0 .00
SO2 NOx TH-MO TRS
13:45
14:00
14:15
14:30
14:45
15:00
15:15

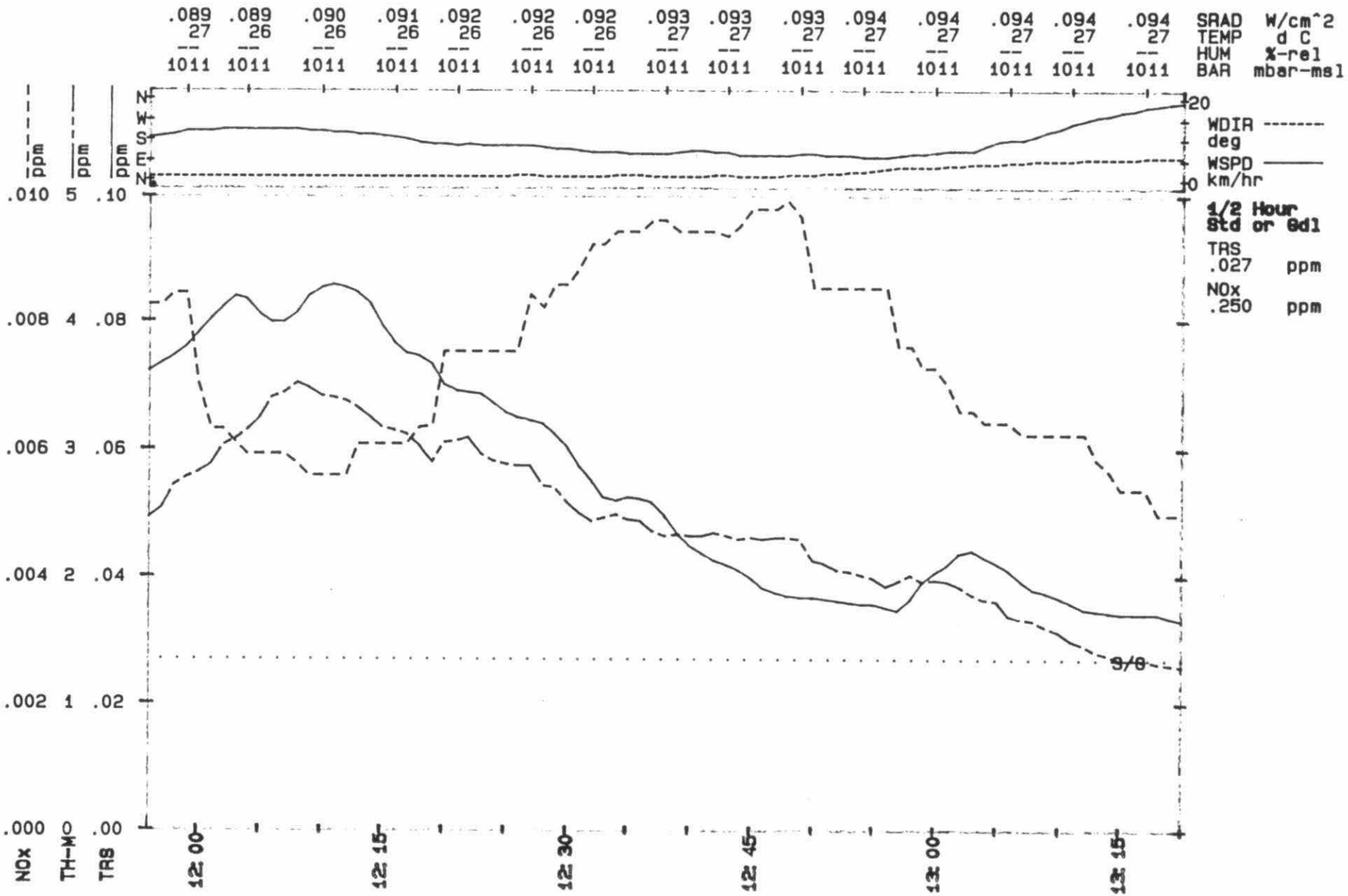
FORT_FRANCES_85: 063B

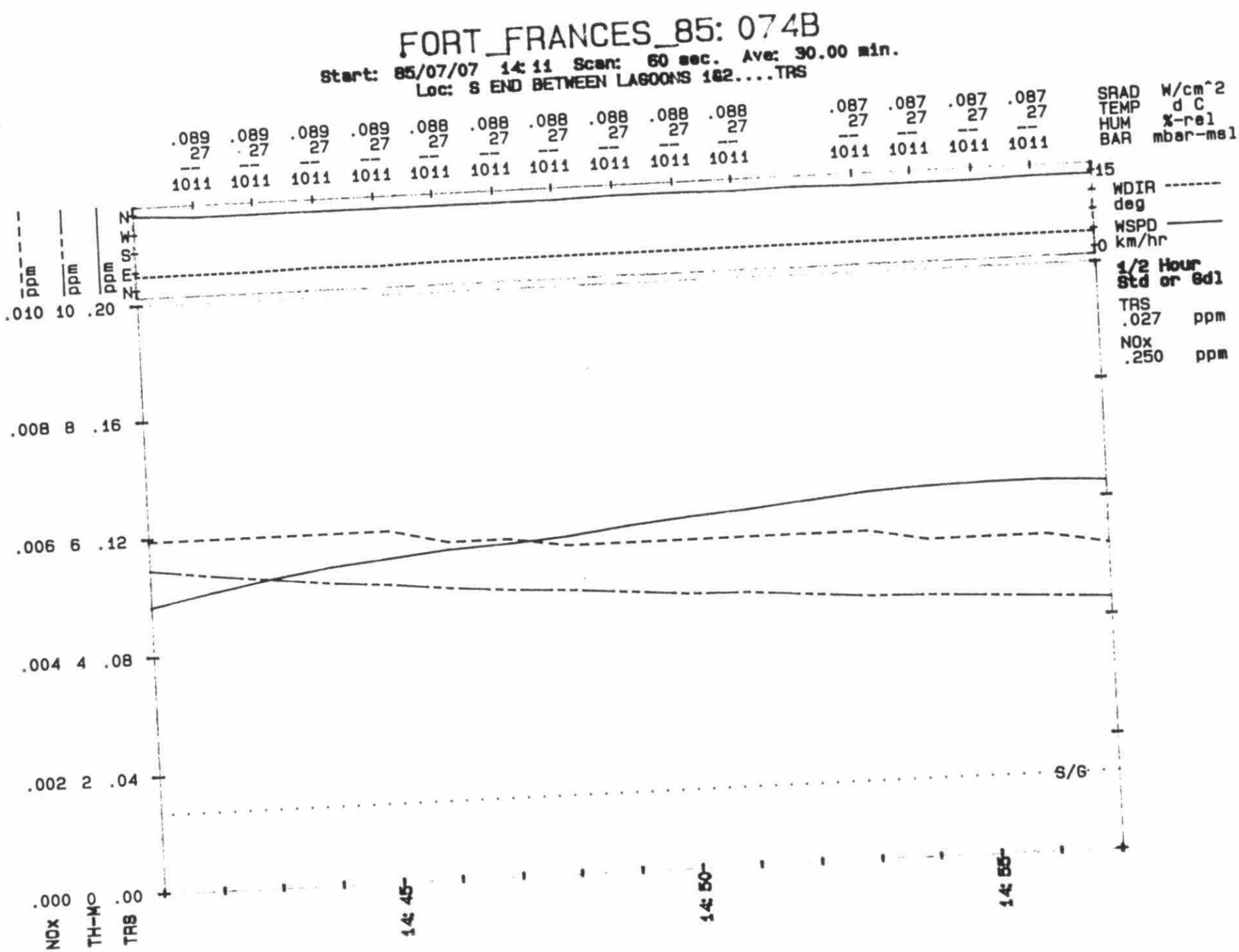
Start: 85/07/06 15:38 Scan: 60 sec. Ave: 30.00 min.
Loc: BACKGROUND AT STP



FORT_FRANCES_85: 072B

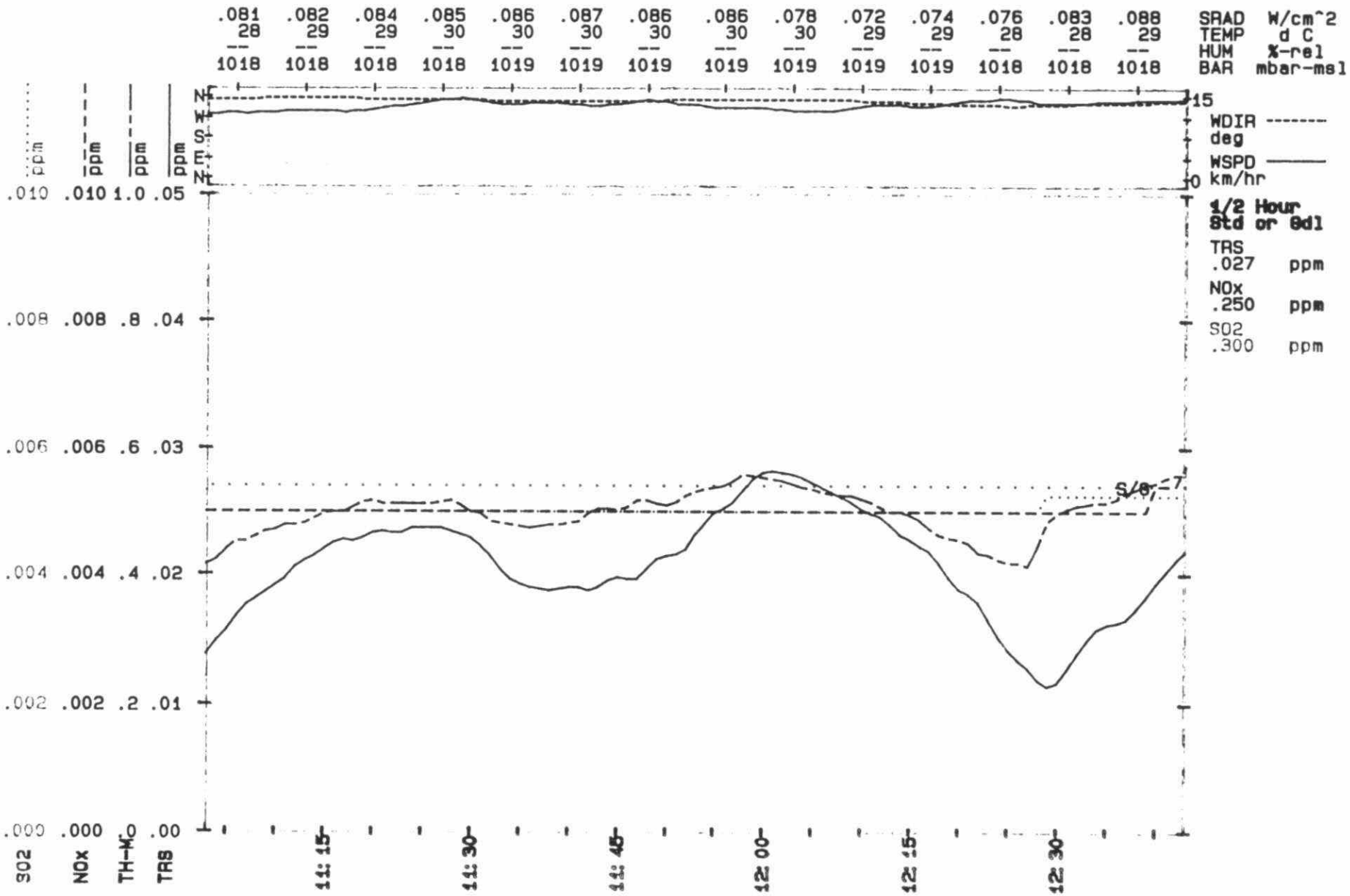
Start: 85/07/07 11:26 Scan: 60 sec. Ave: 30.00 min.
Loc: NW CORNER LAGOON #2....TRS

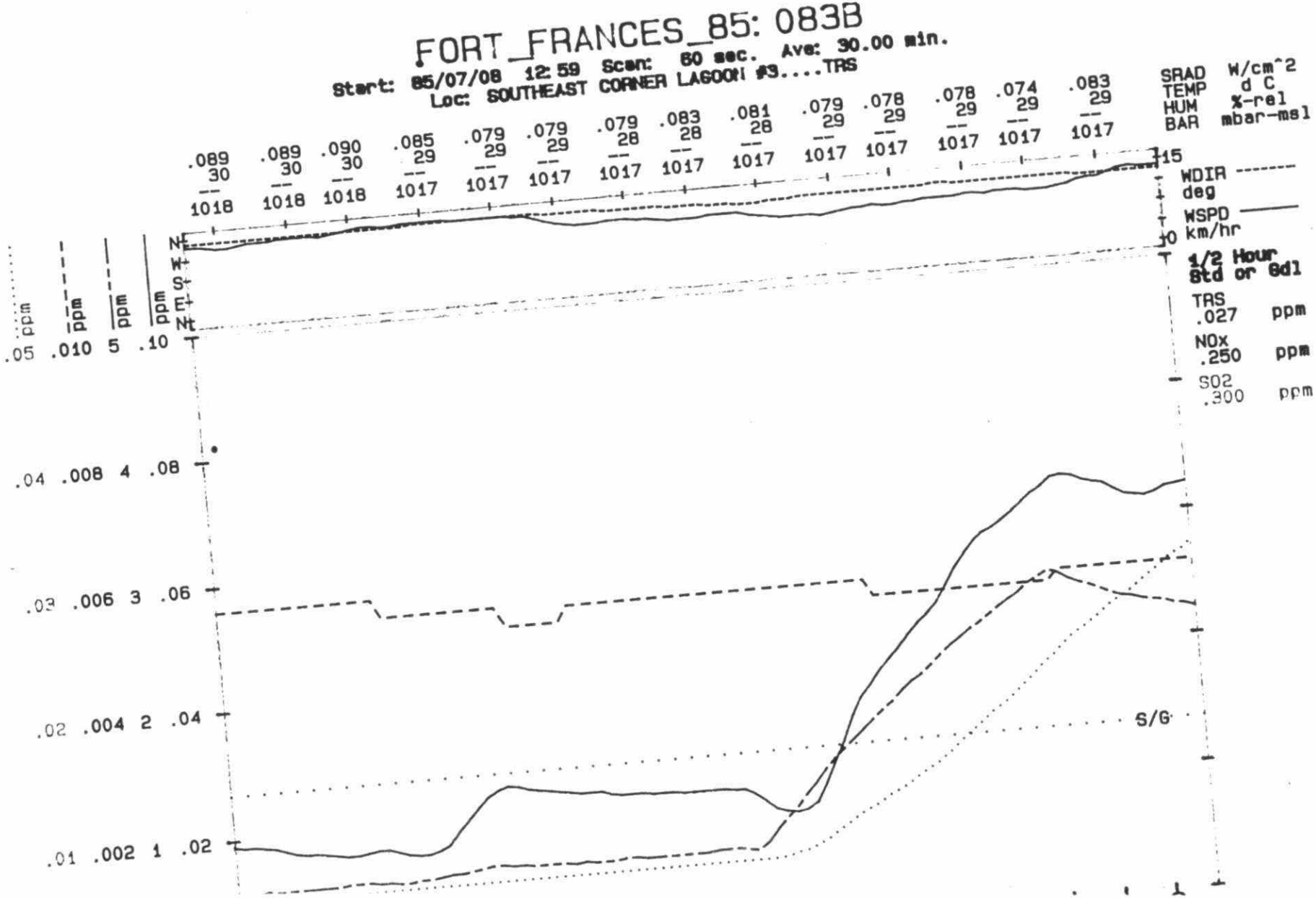



FORT_FRANCES_85: 074B
Start: 85/07/07 14:11 Scan: 60 sec. Ave: 30.00 min.
Loc: S END BETWEEN LAGOONS 1&2....TRS
.089 27 -- 1011
.089 27 -- 1011
.089 27 -- 1011
.089 27 -- 1011
.088 27 -- 1011
.088 27 -- 1011
.088 27 -- 1011
.088 27 -- 1011
.088 27 -- 1011
.088 27 -- 1011
.087 27 -- 1011
.087 27 -- 1011
.087 27 -- 1011
.087 27 -- 1011
SRAD W/cm^2
TEMP d C
HUM %-rel
BAR mbar-msl
15
0
WDIR
deg
WSPD
km/hr
1/2 Hour Std or Gdl
TRS .027 ppm
NOx .250 ppm
ppm
ppm
ppm
N
E
S
W
N
.010 10 .20
.008 8 .16
.006 6 .12
.004 4 .08
.002 2 .04
.000 0 .00
NOx
TH-HC
TRS
S/G
14:45
14:50
14:55

FORT_FRANCES_85: 082B

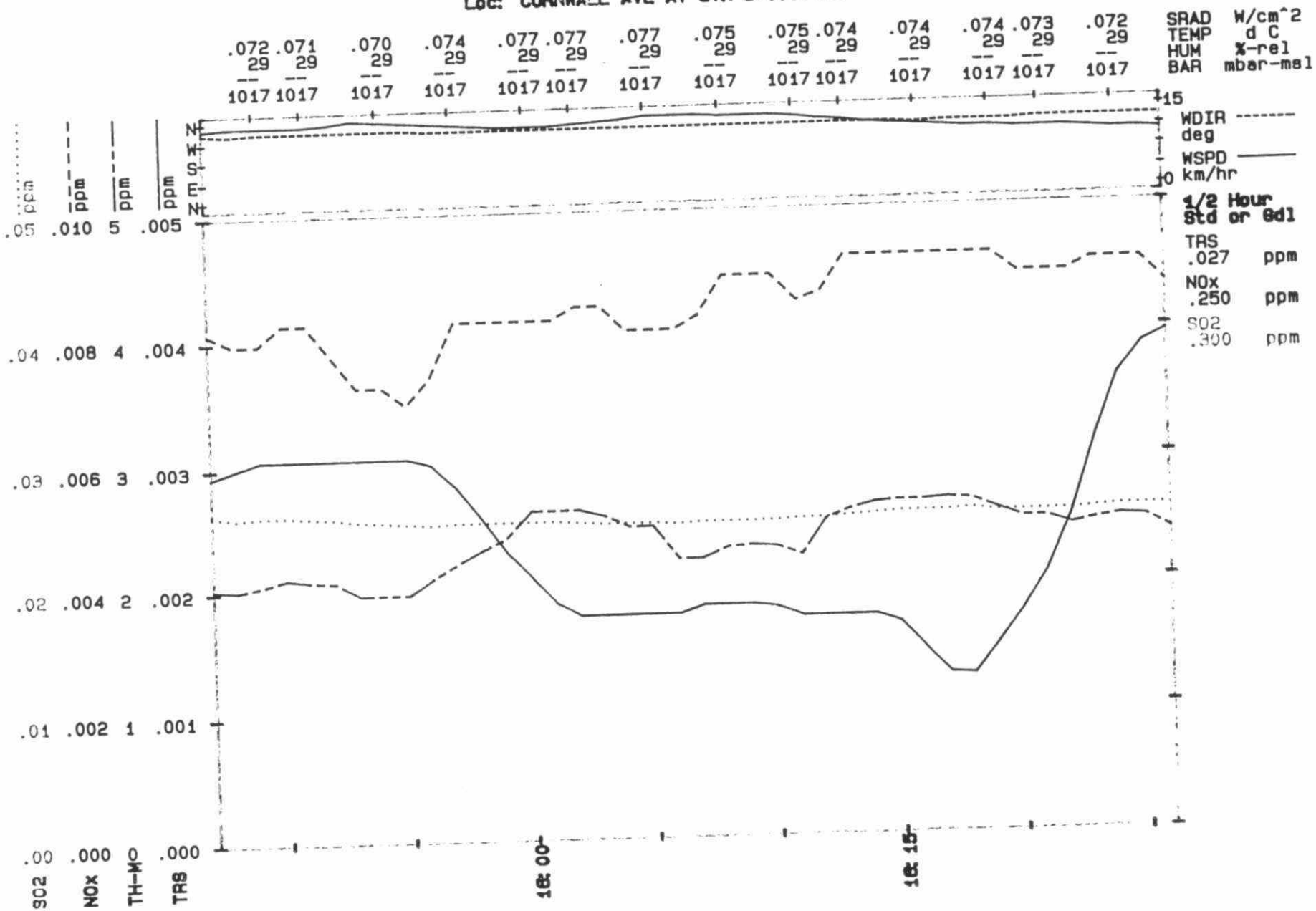
Start: 85/07/08 10:33 Scan: 60 sec. Ave: 30.00 min.
Loc: 8TH ST SOUTH OF LAGOON #2....TRS




FORT_FRANCES_85: 083B
Start: 85/07/08 12:59 Scan: 60 sec. Ave: 30.00 min.
Loc: SOUTHEAST CORNER LAGOON #3....TRS
SRAD W/cm^2
TEMP d C
HUM %-rel
BAR mbar-msl
.089 .089 .090 .085 .079 .079 .079 .083 .081 .079 .078 .078 .074 .083
30 30 30 29 29 29 28 28 28 29 29 29 29 29
1018 1018 1018 1017 1017 1017 1017 1017 1017 1017 1017 1017 1017 1017
N
W
S
E
N
WDIR deg
WSPD km/hr
15
10
1/2 Hour Std or Adl
TRS .027 ppm
NOx .250 ppm
SO2 .300 ppm
ppm
ppm
ppm
ppm
.05 .010 5 .10
.04 .008 4 .08
.03 .006 3 .06
.02 .004 2 .04
.01 .002 1 .02
S/G

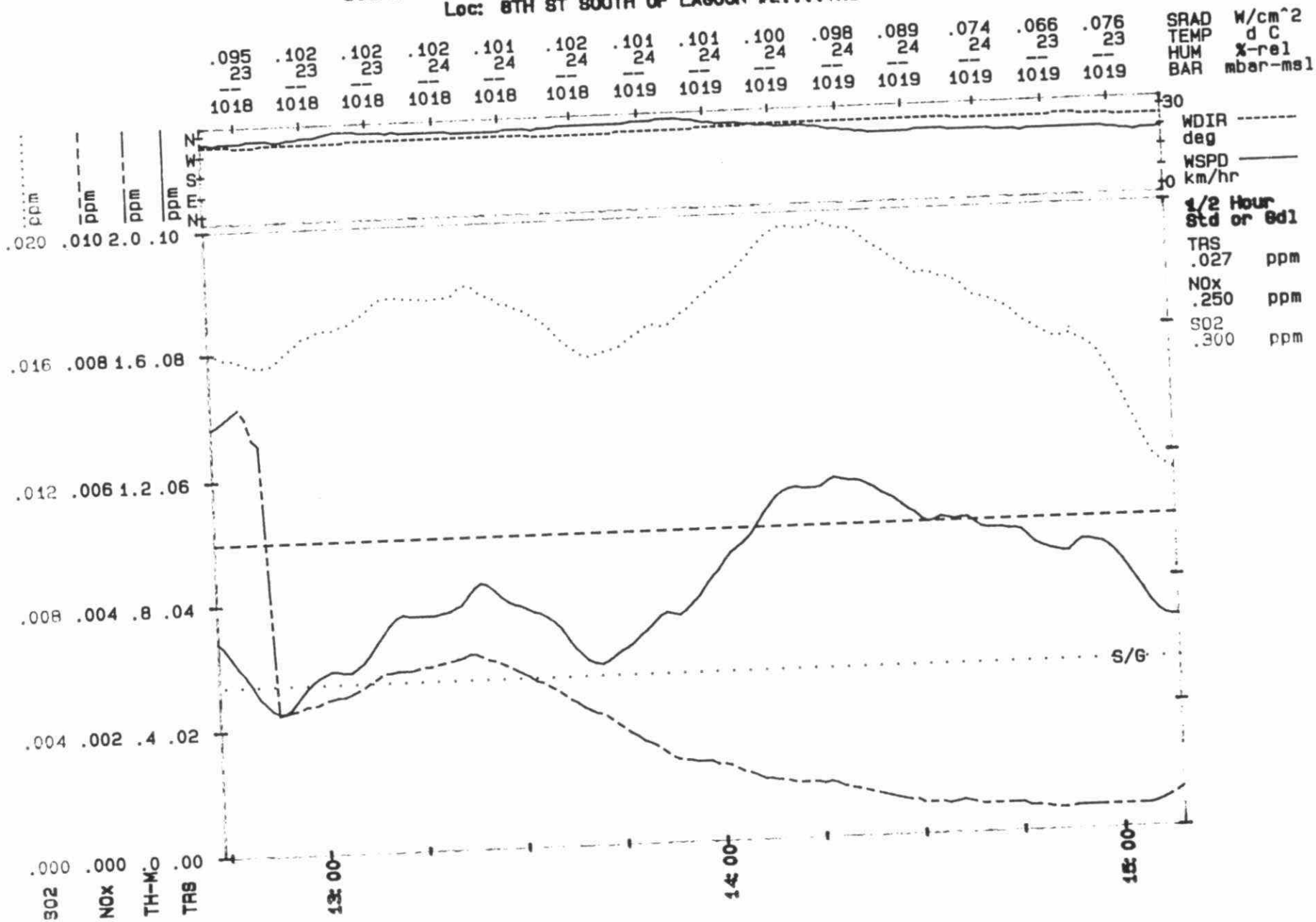
FORT_FRANCES_85: 084B

Start: 85/07/08 15:17 Scan: 60 sec. Ave: 30.00 min.
Loc: CORNWALL AVE AT 8TH ST....TRS



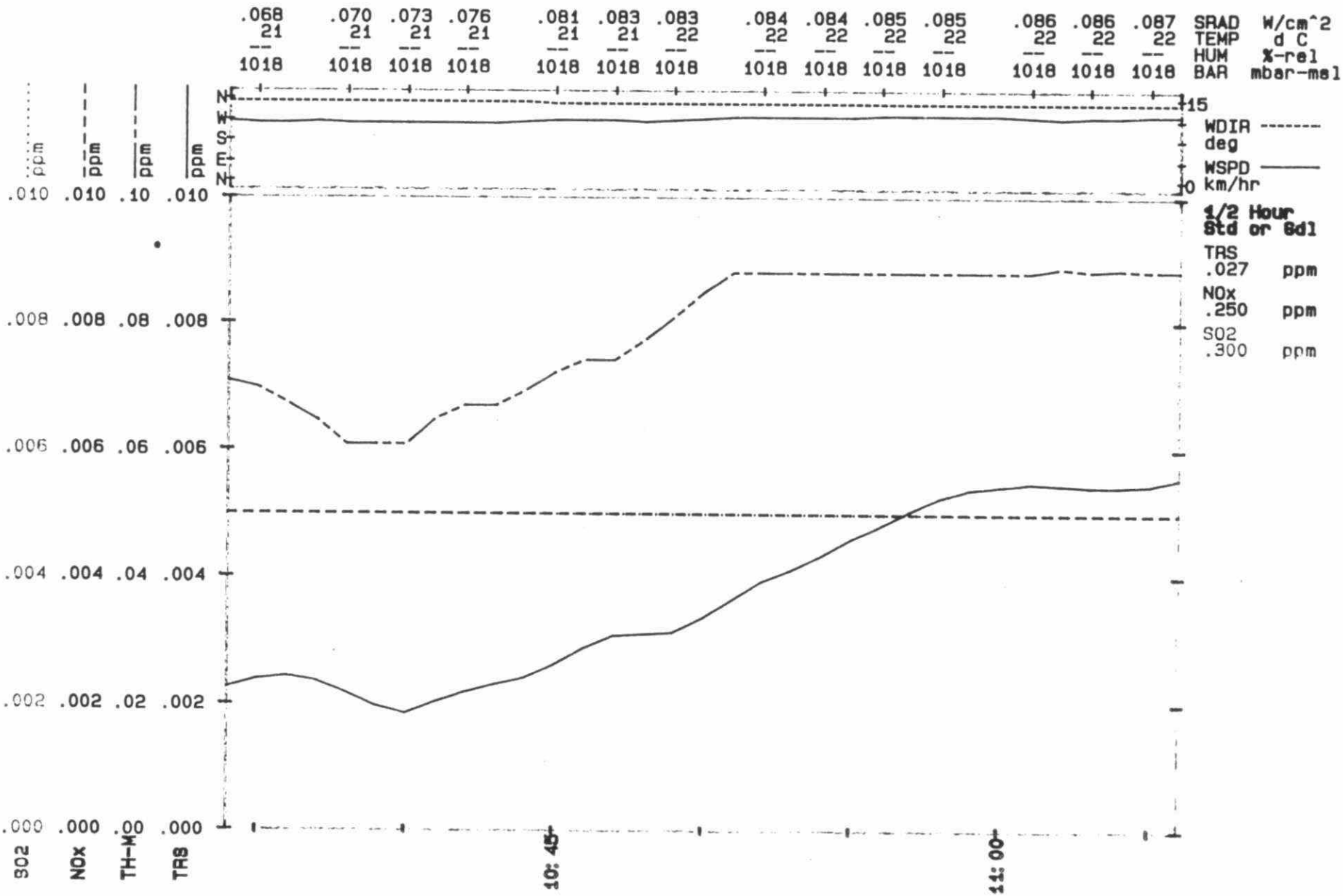
FORT_FRANCES_85: 091B

Start: 85/07/09 12:14 Scan: 60 sec. Ave: 30.00 min.
Loc: 8TH ST SOUTH OF LAGOON #2....TRS



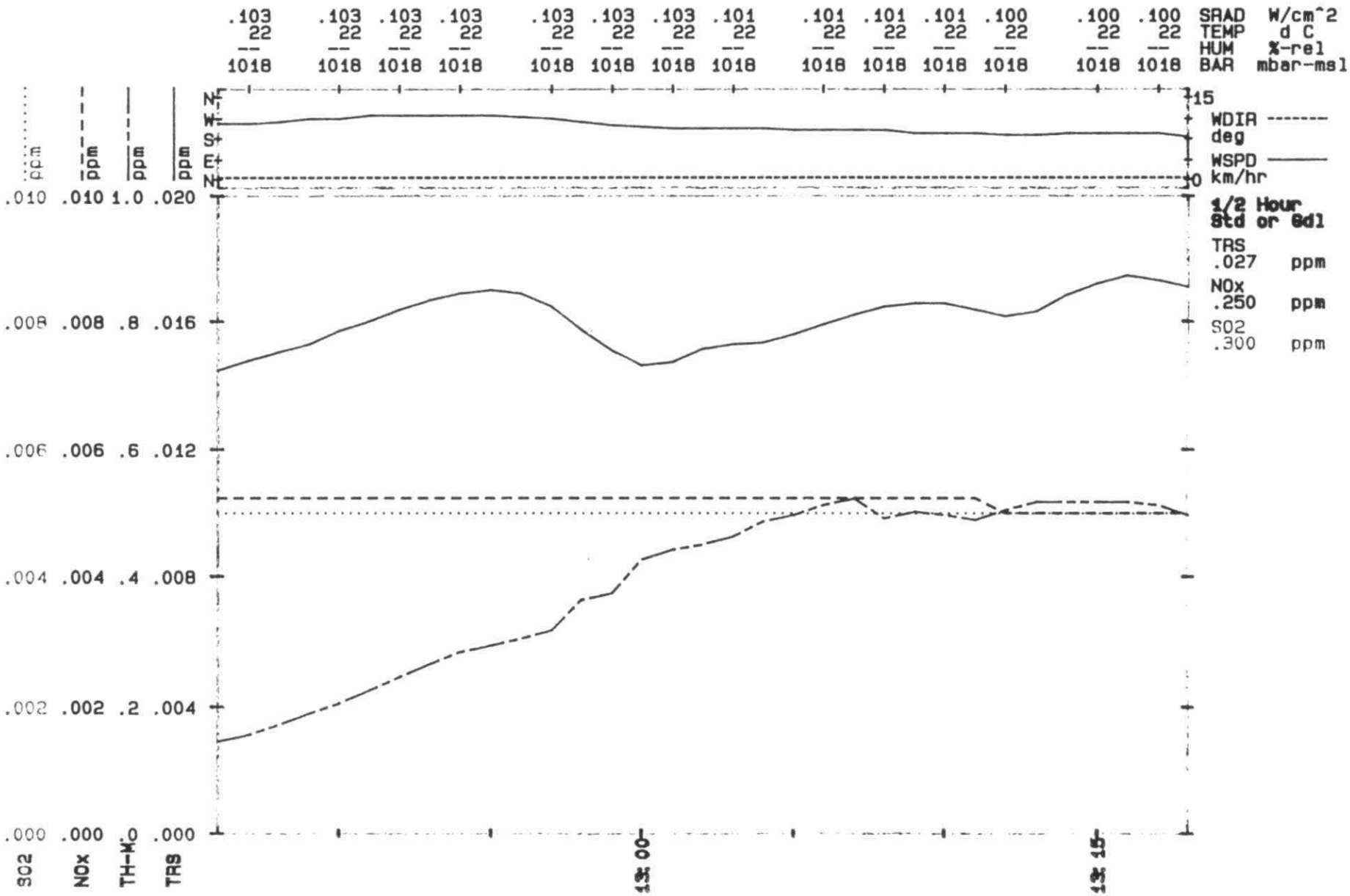
FORT_FRANCES_85: 101B

Start: 85/07/10 10:04 Scan: 60 sec. Ave: 30.00 min.
Loc: 5TH ST 200M EAST OF RR TRACKS....TRS



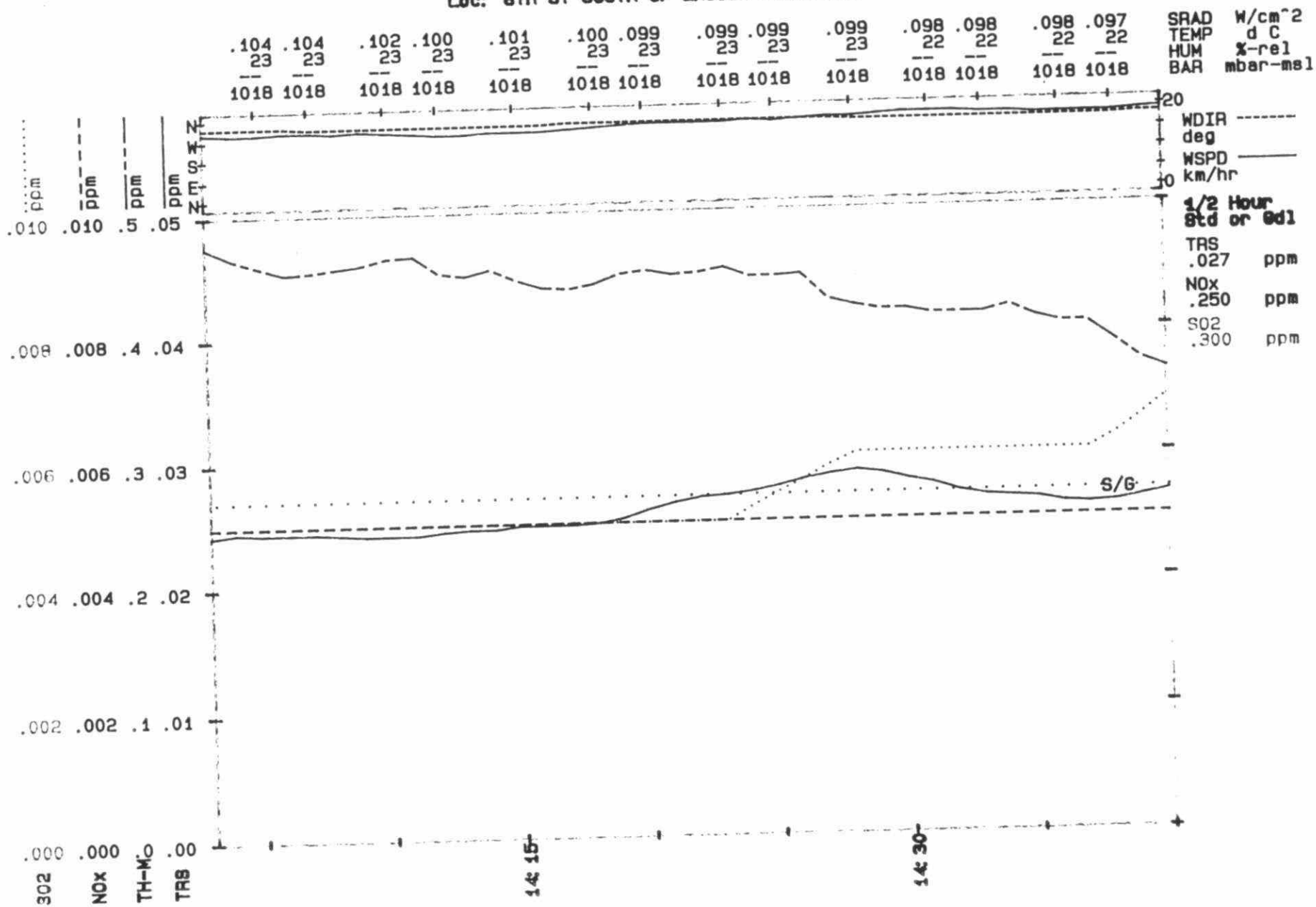
FORT_FRANCES_85: 103B

Start: 85/07/10 12:16 Scan: 60 sec. Ave: 30.00 min.
Loc: 1046 CORNWALL AVE....TRS



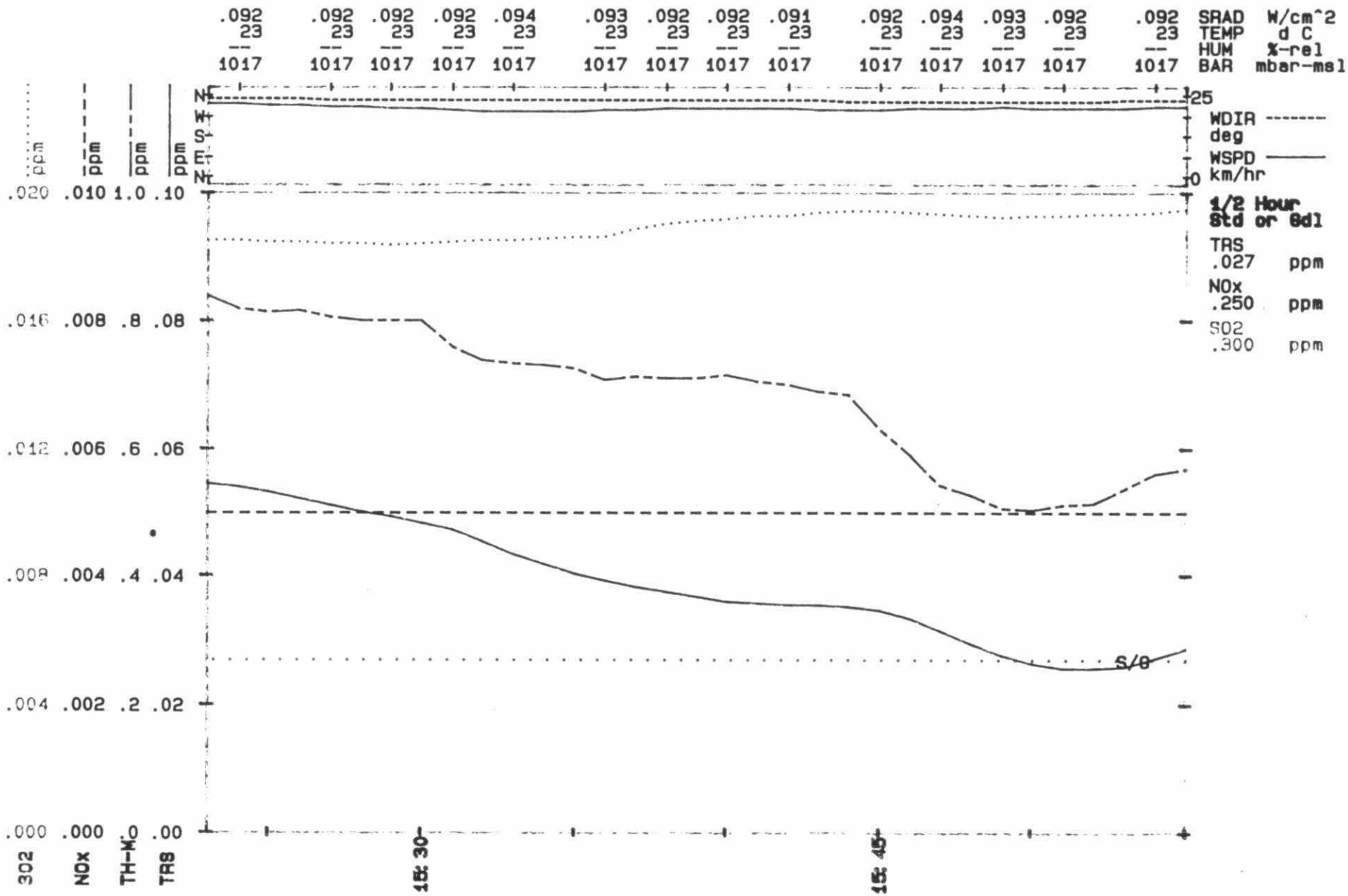
FORT_FRANCES_85: 104B

Start: 85/07/10 13:33 Scan: 60 sec. Ave: 30.00 min.
Loc: 8TH ST SOUTH OF LAGOON #1....TRS



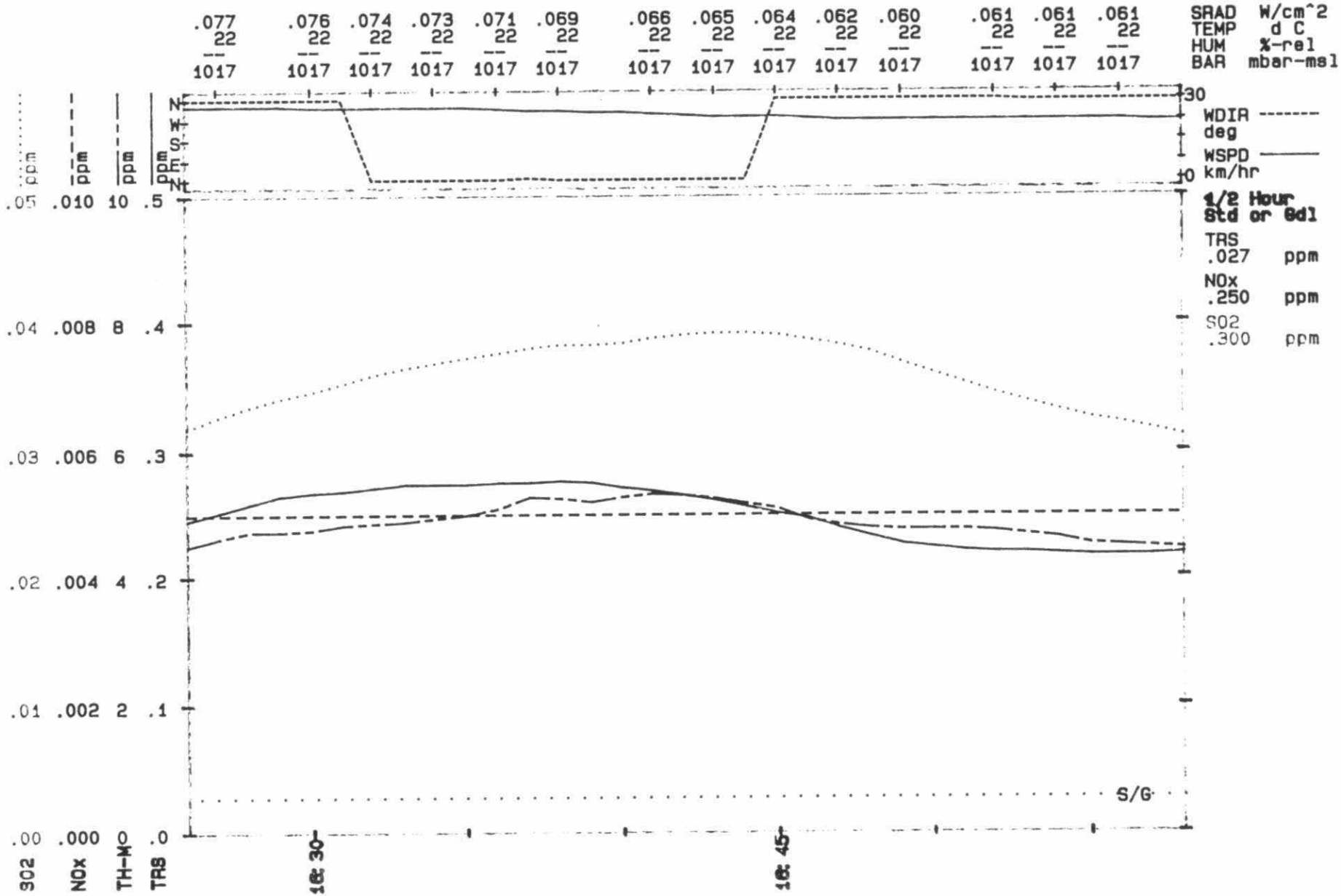
FORT_FRANCES_85: 105B

Start: 85/07/10 14:53 Scan: 60 sec. Ave: 30.00 min.
Loc: SW CORNER LAGOON #1....TRS



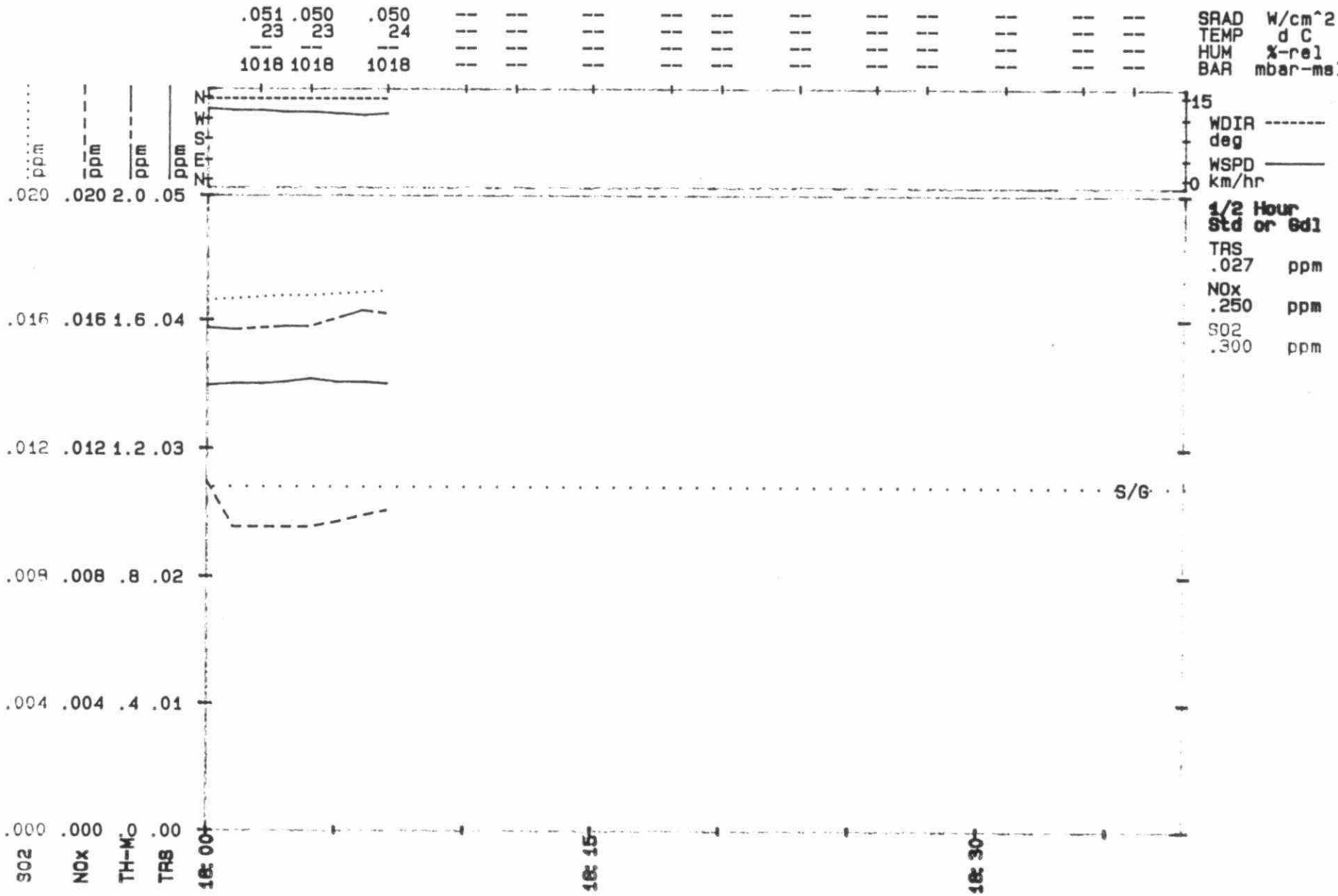
FORT_FRANCES_85: 106B

Start: 85/07/10 15:56 Scan: 60 sec. Ave: 30.00 min.
Loc: SW CORNER LAGOON #1....TRS



FORT_FRANCES_85: 107B

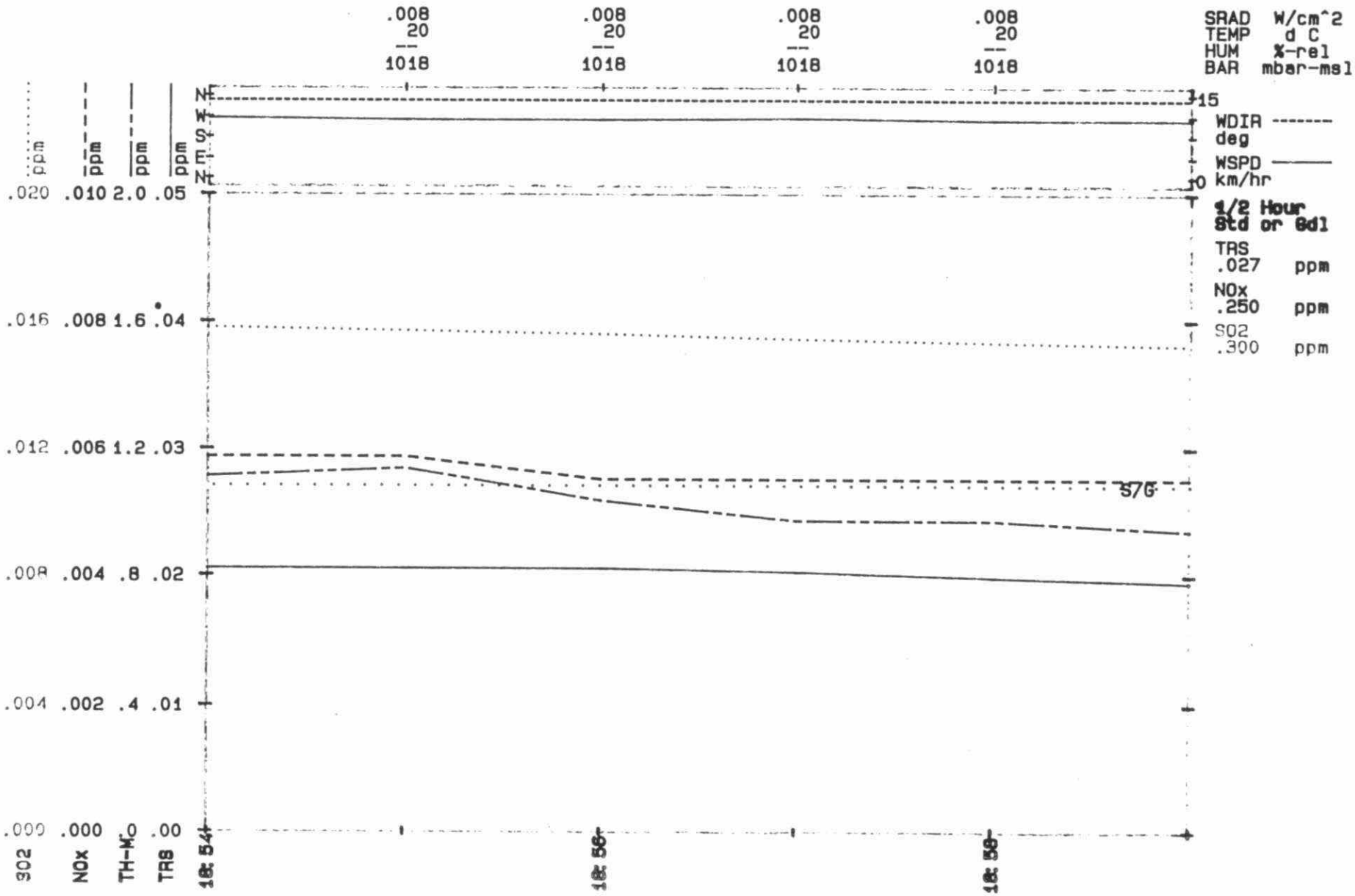
Start: 85/07/10 17:30 Scan: 60 sec. Ave: 30.00 min.
Loc: 1064 CORNWALL AVE....TRS



45

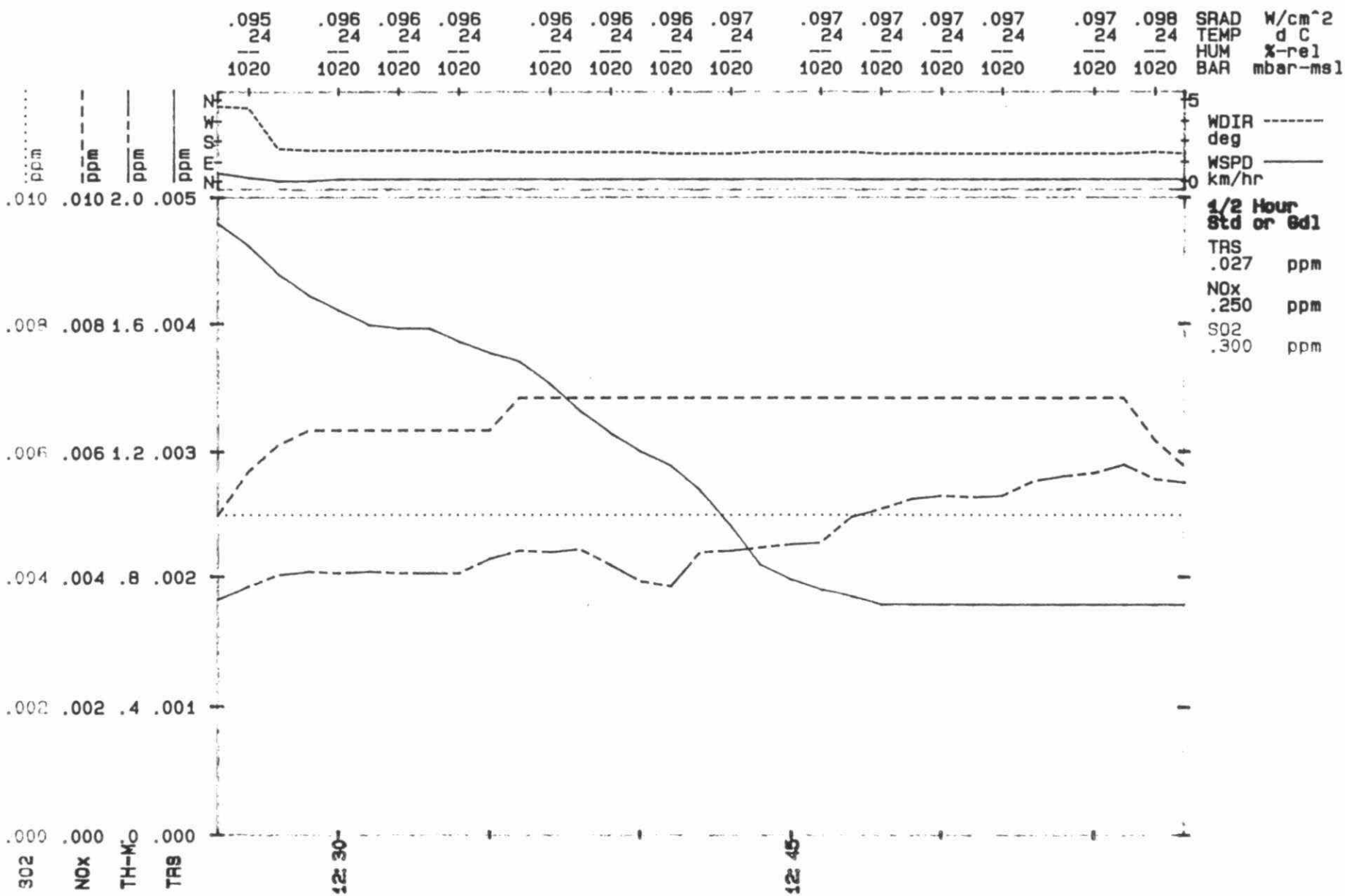
FORT_FRANCES_85: 108B

Start: 85/07/10 18:24 Scan: 60 sec. Ave: 30.00 min.
Loc: 106 SIXTH ST....TRS



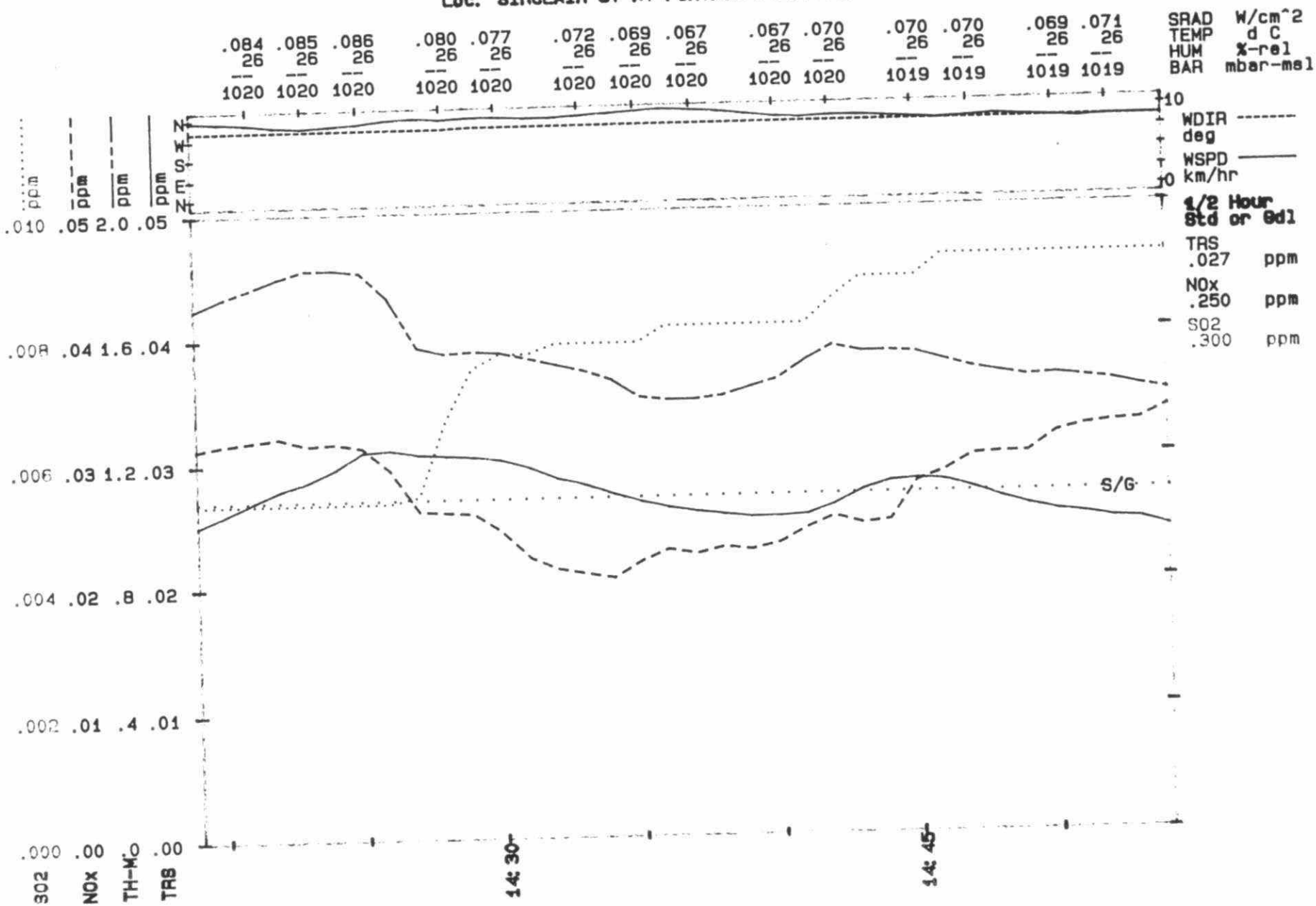
FORT_FRANCES_85: 111B

Start: 85/07/11 11:56 Scan: 60 sec. Ave: 30.00 min.
Loc: 1031 WALKER AVE....TRS



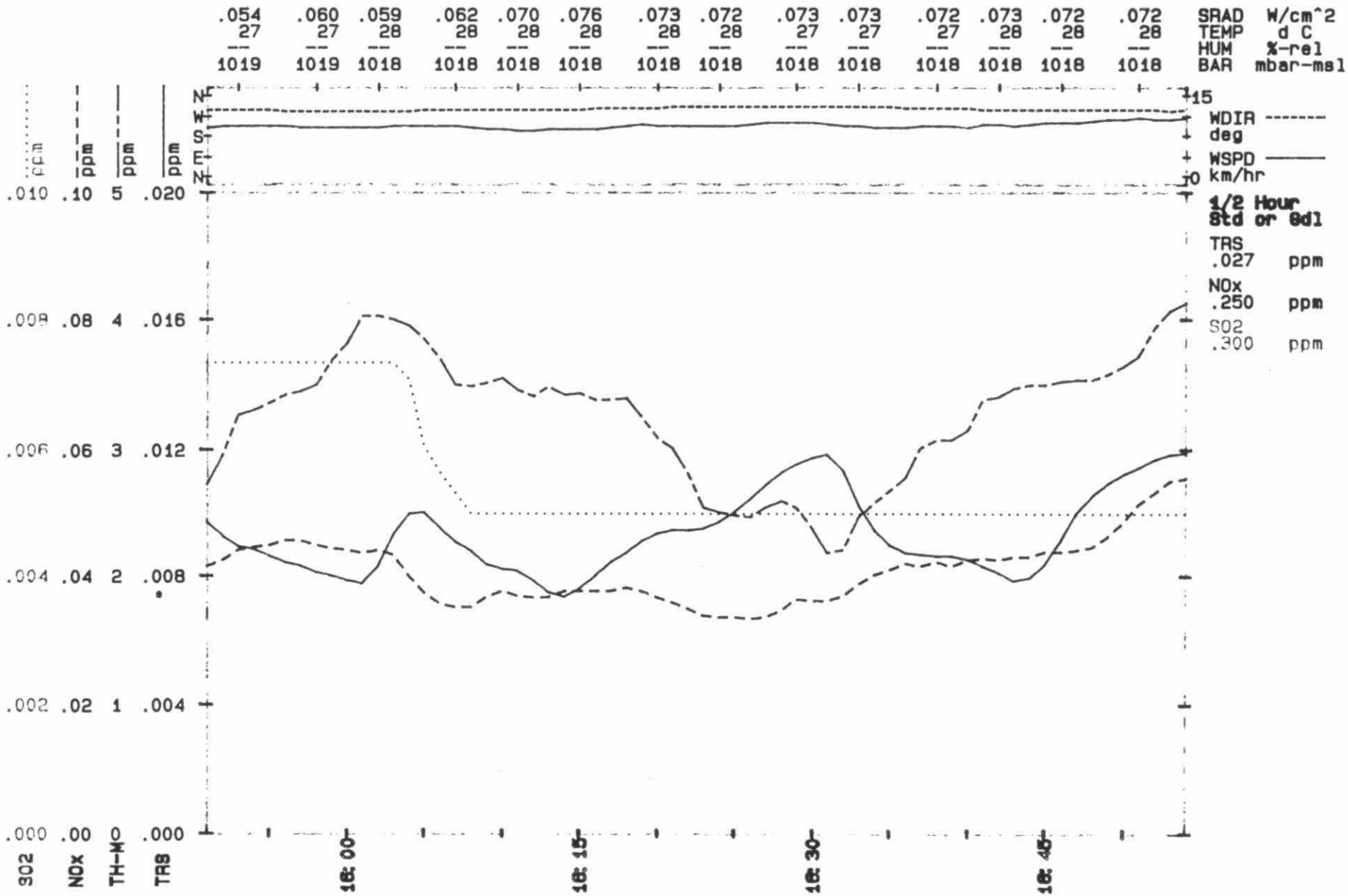
FORT_FRANCES_85: 112B

Start: 85/07/11 13:49 Scan: 60 sec. Ave: 30.00 min.
Loc: SINCLAIR ST AT PORTAGE AVE....TRS



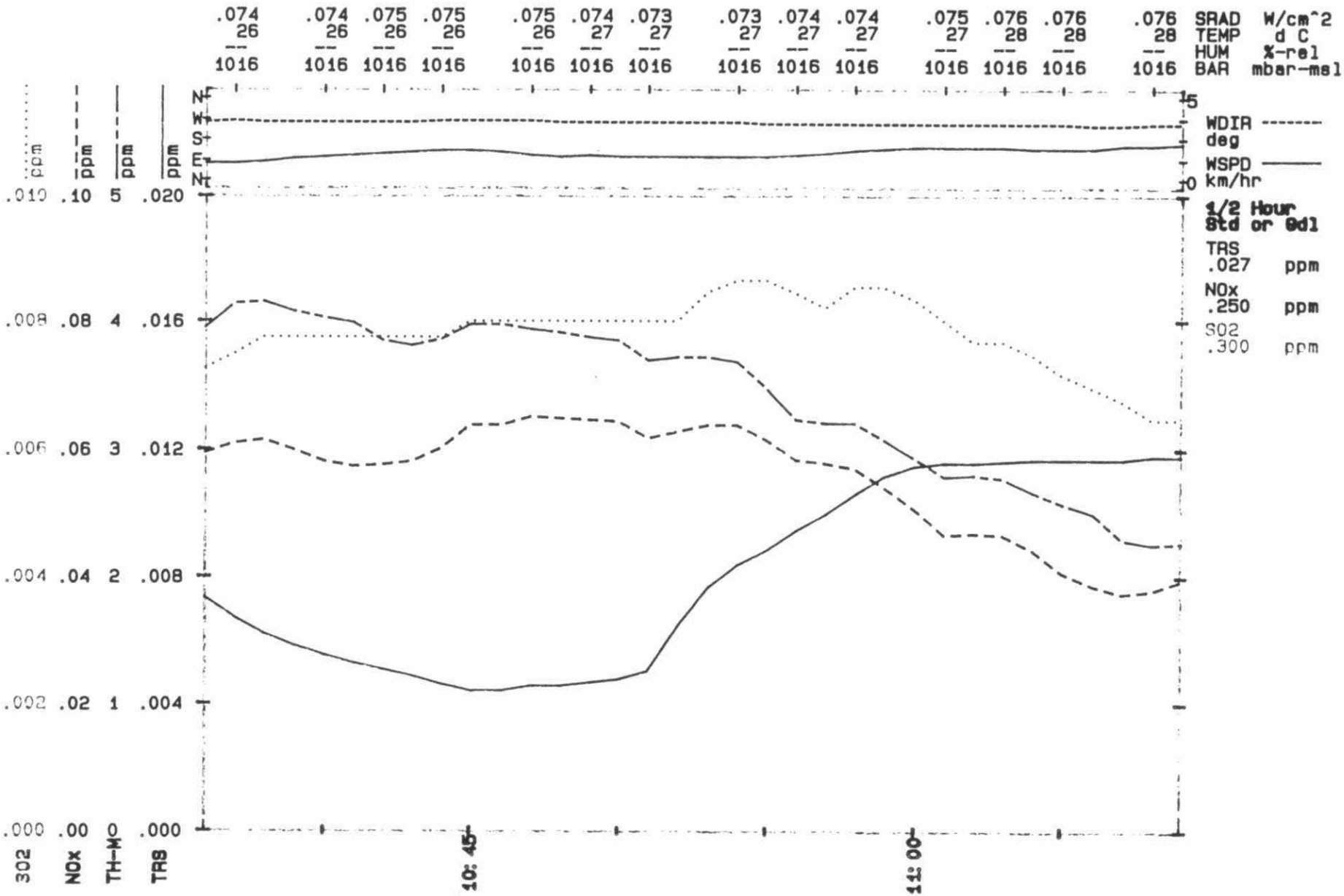
FORT_FRANCES_85: 113B

Start: 85/07/11 15:21 Scan: 60 sec. Ave: 30.00 min.
Loc: VICTORIA AVE AT HOSPITAL....TRS



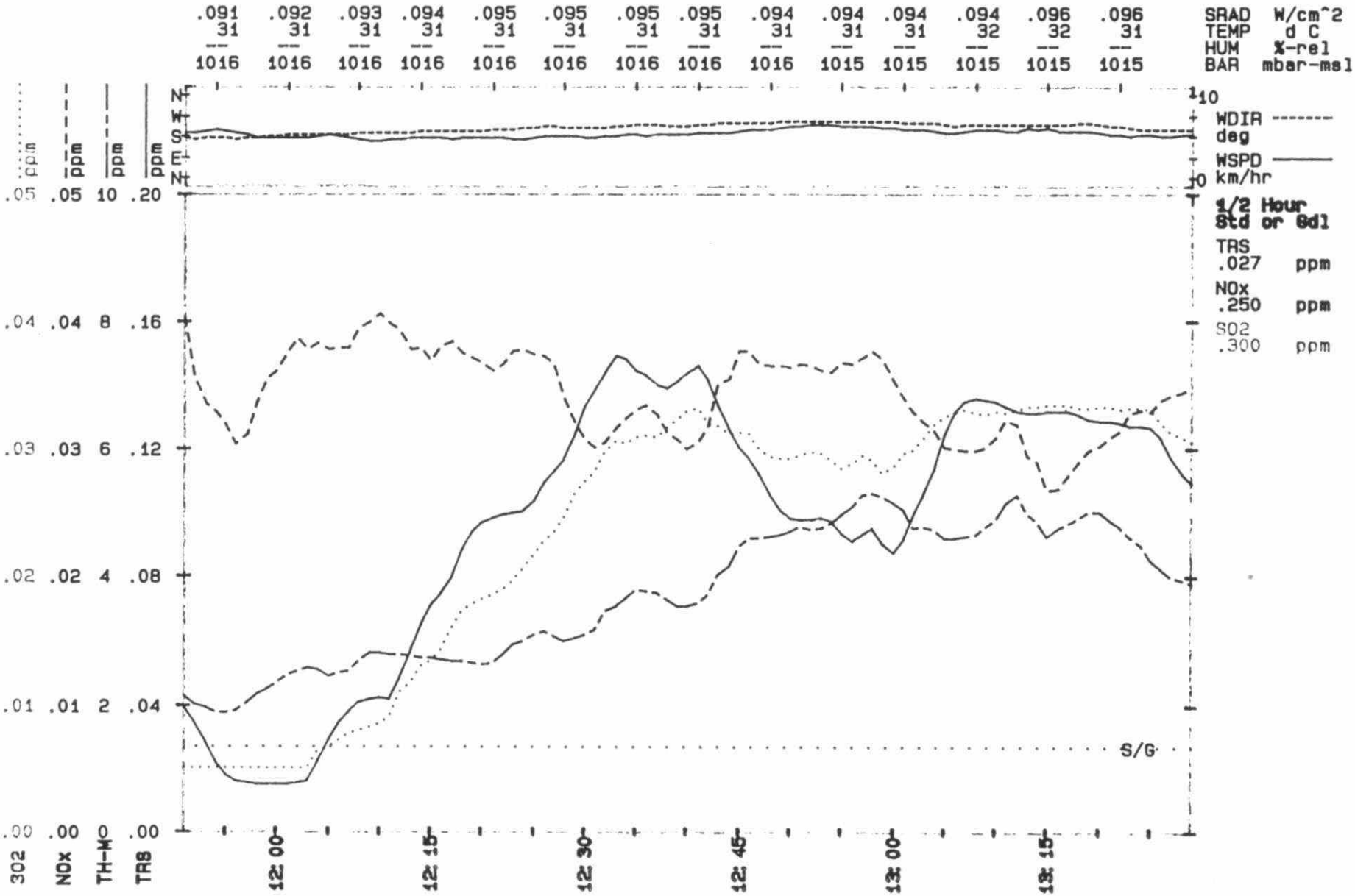
FORT_FRANCES_85: 122B

Start: 85/07/12 10:06 Scan: 60 sec. Ave: 30.00 min.
Loc: CHURCH ST AT SOC SERV BLDG....TRS



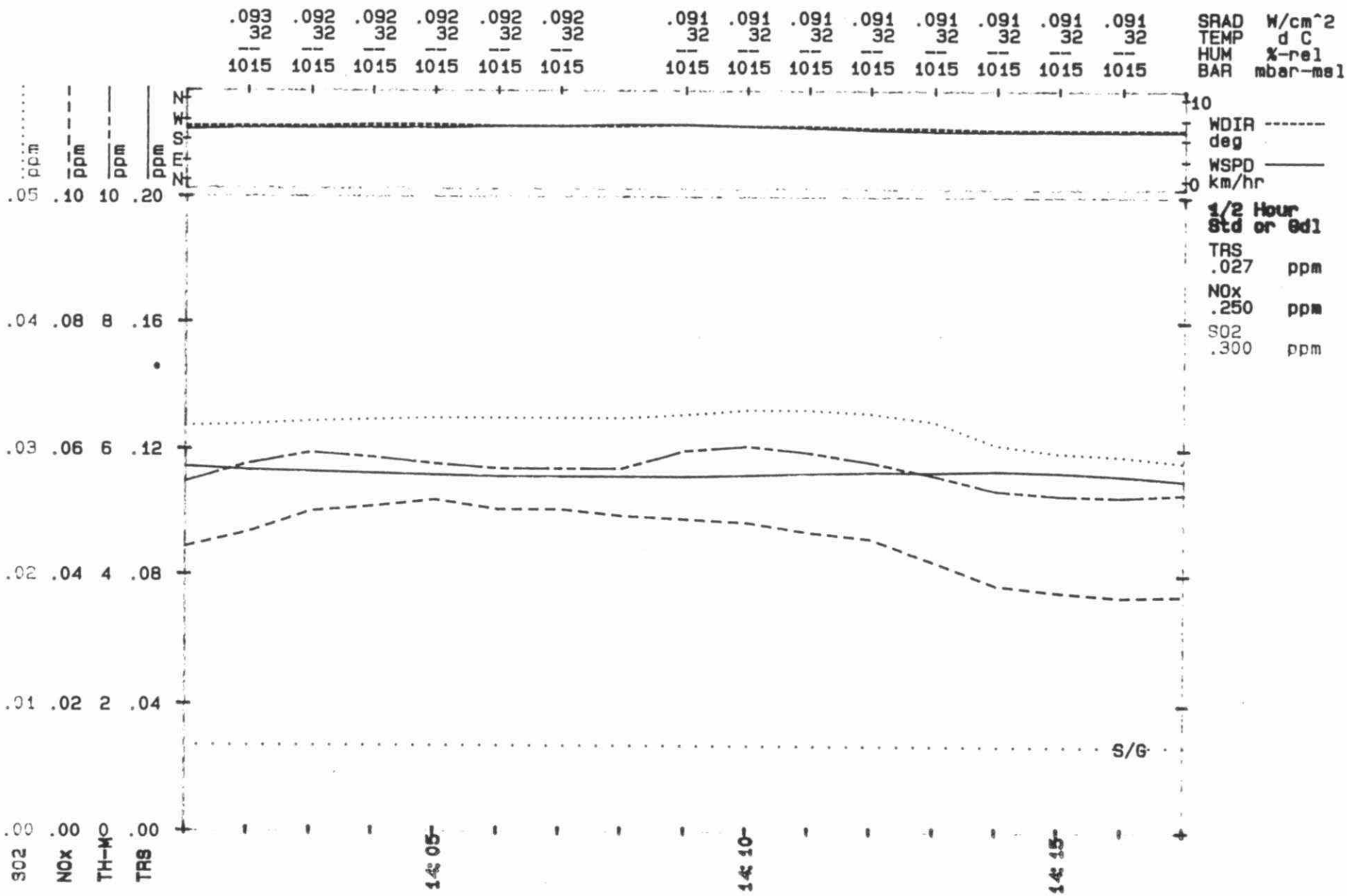
FORT_FRANCES_85: 123B

Start: 85/07/12 11:21 Scan: 60 sec. Ave: 30.00 min.
Loc: NW CORNER PORTAGE AVE & NELSON ST....TRS



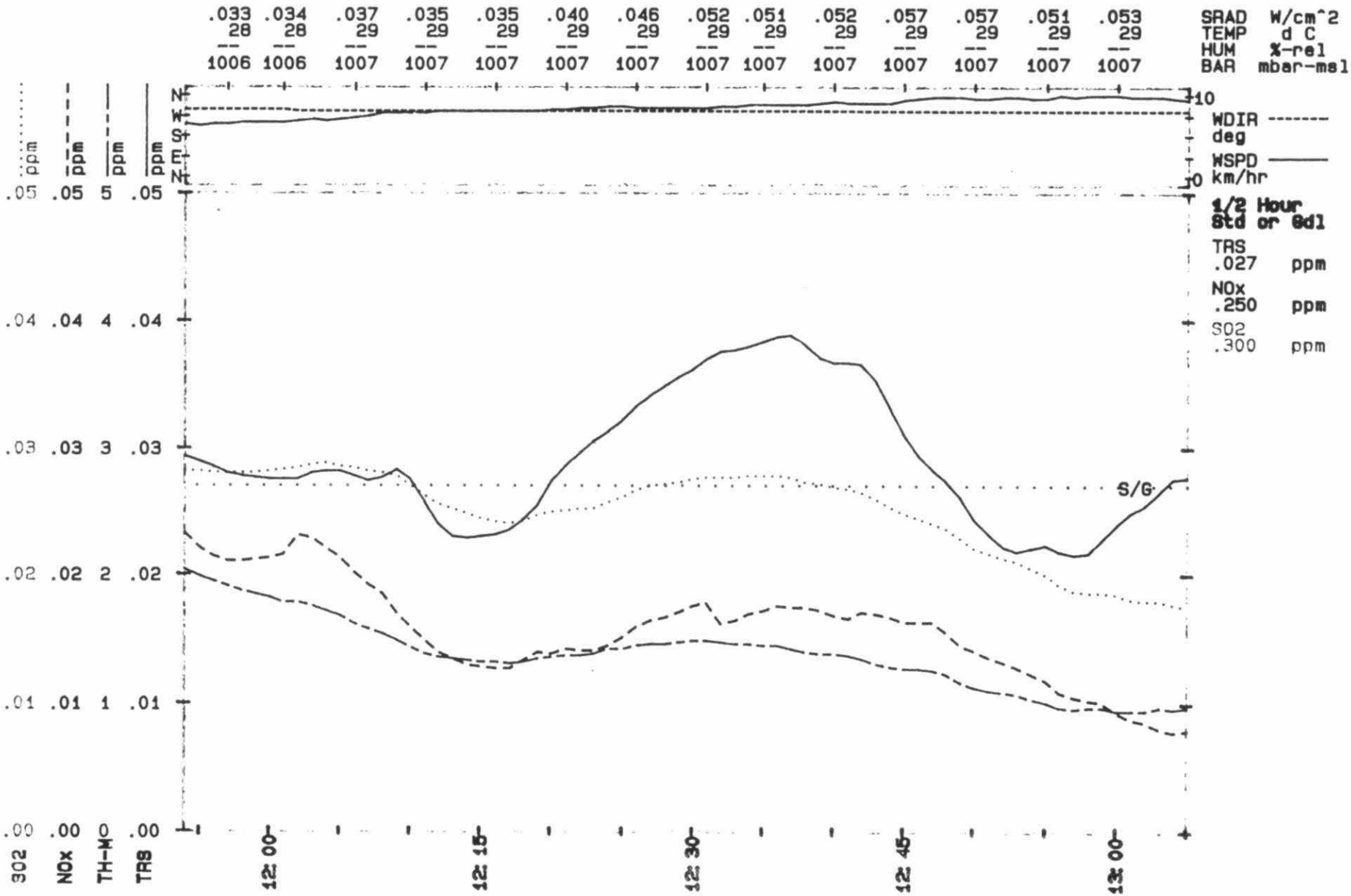
FORT_FRANCES_85: 124B

Start: 85/07/12 13:31 Scan: 60 sec. Ave: 30.00 min.
Loc: NW CORNER PORTAGE AVE & NELSON ST....TRS



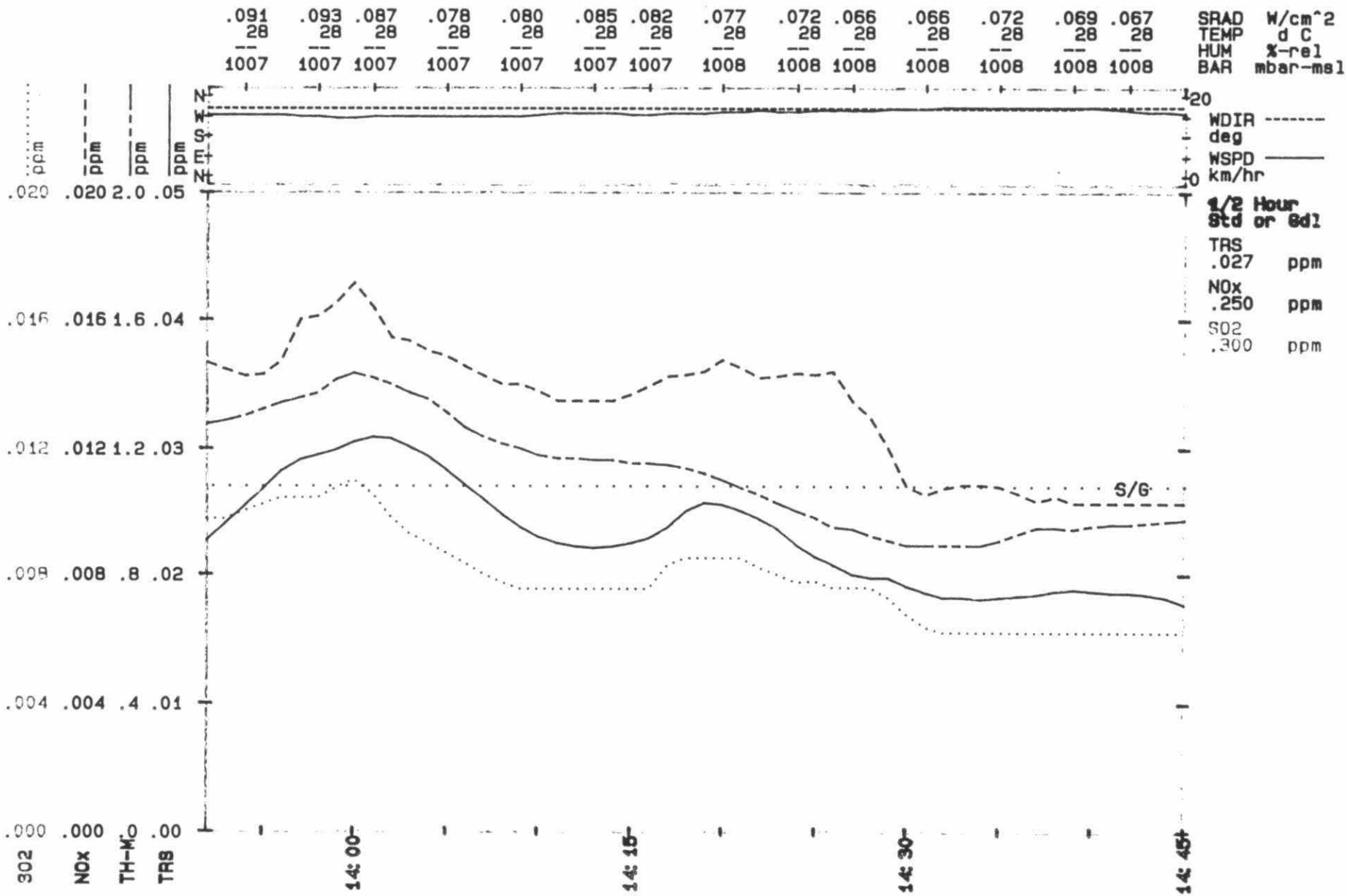
FORT_FRANCES_85: 131B

Start: 85/07/13 11:24 Scan: 60 sec. Ave: 30.00 min.
Loc: SINCLAIR ST 30M W OF VICTORIA AVE....TRS



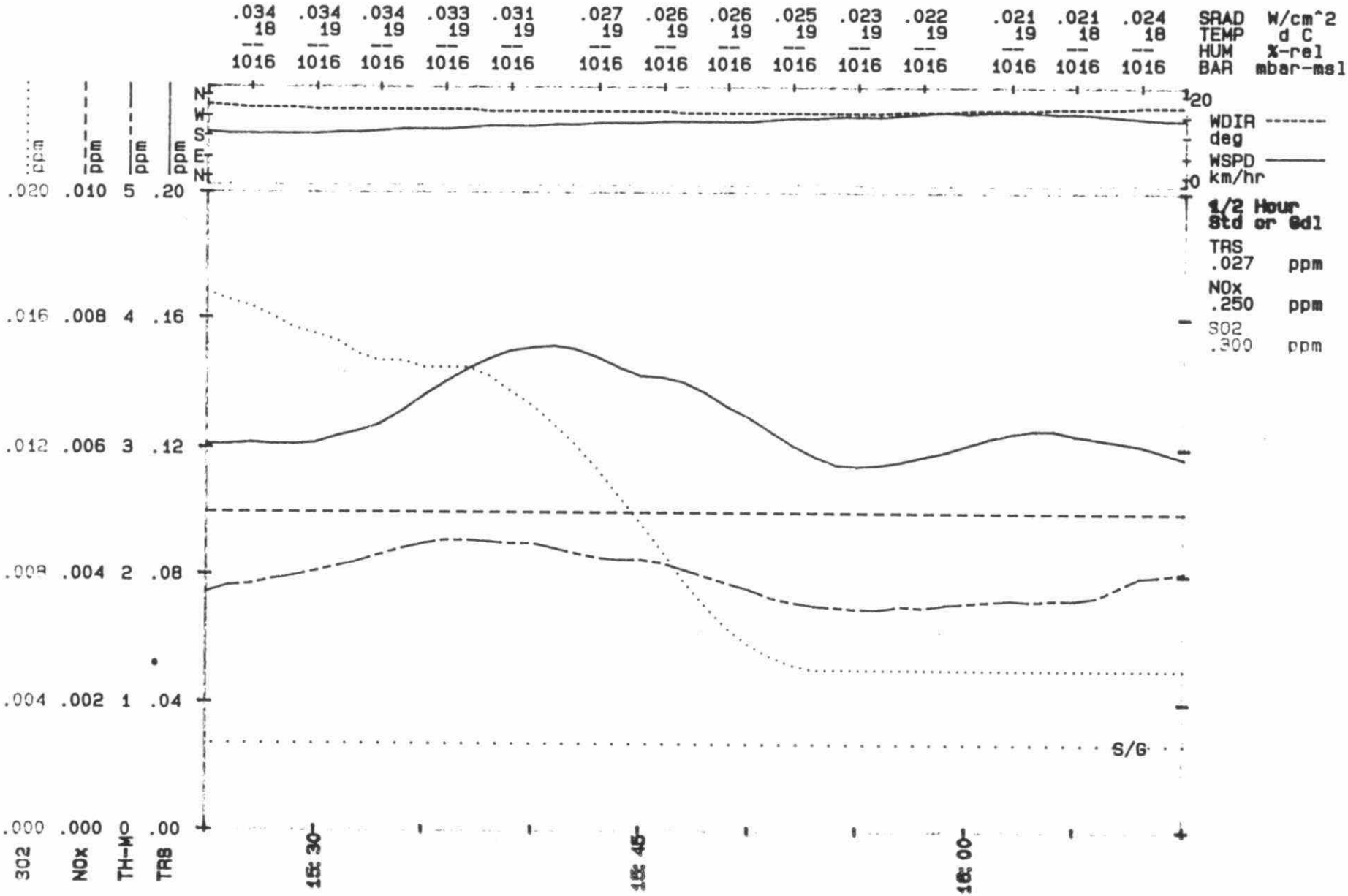
FORT_FRANCES_85: 132B

Start: 85/07/13 13:22 Scan: 60 sec. Ave: 30.00 min.
Loc: VICTORIA AVE AT HOSPITAL....TRS



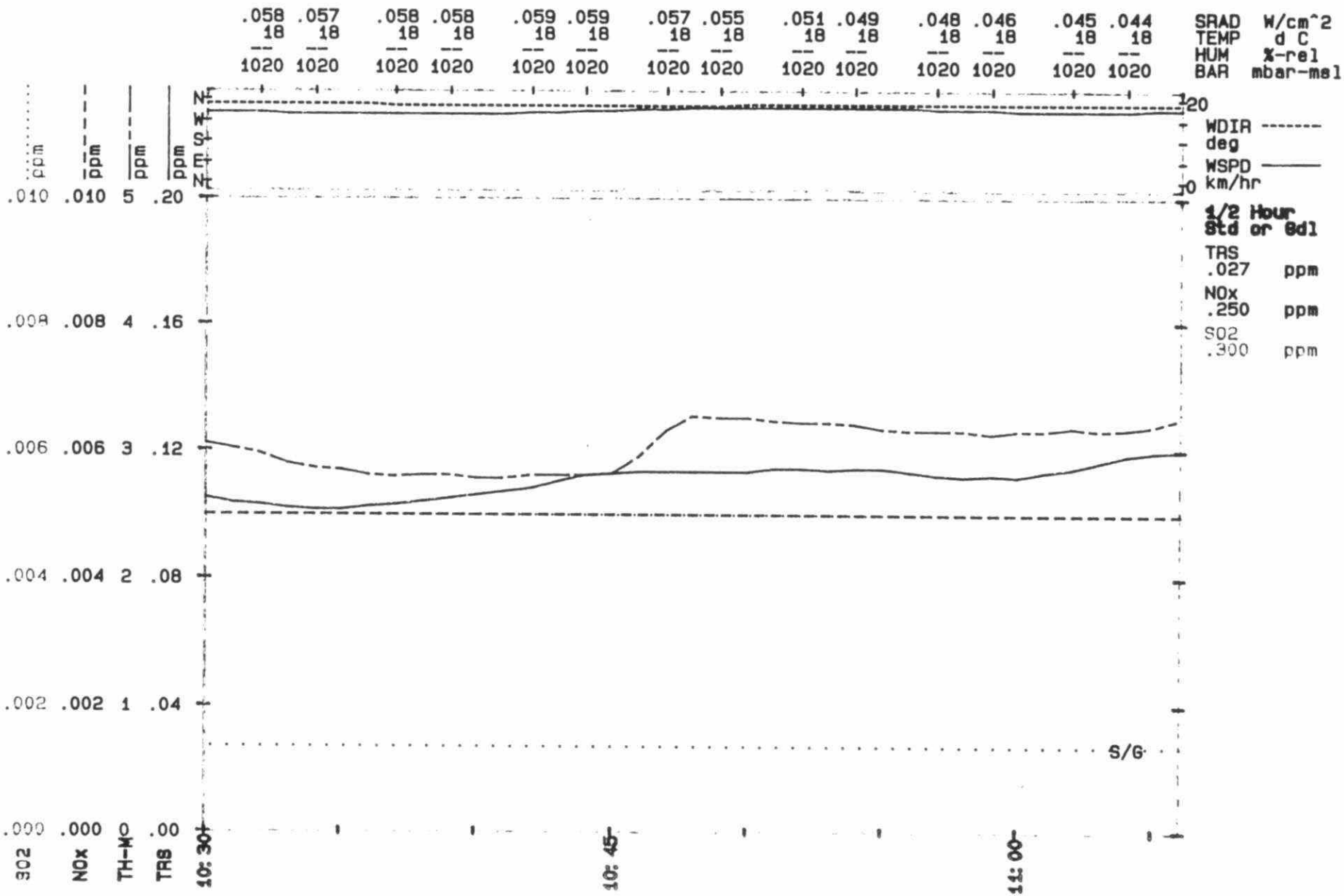
FORT_FRANCES_85: 141B

Start: 85/07/14 14:55 Scan: 60 sec. Ave: 30.00 min.
Loc: SE CORNER LAGOON #2....TRS



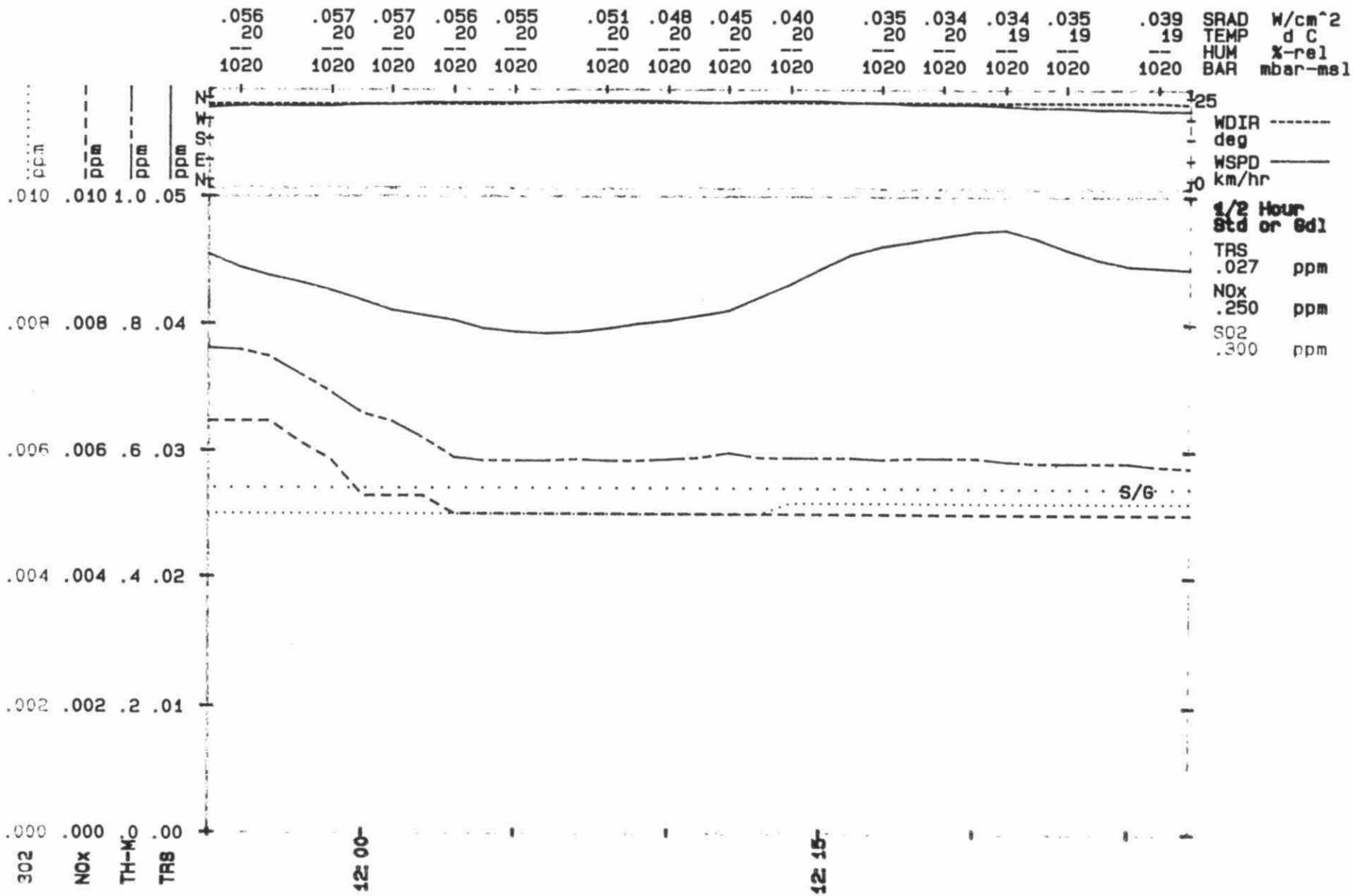
FORT_FRANCES_85: 151B

Start: 85/07/15 10:00 Scan: 60 sec. Ave: 30.00 min.
Loc: NW CORNER LAGOON #2....TRS



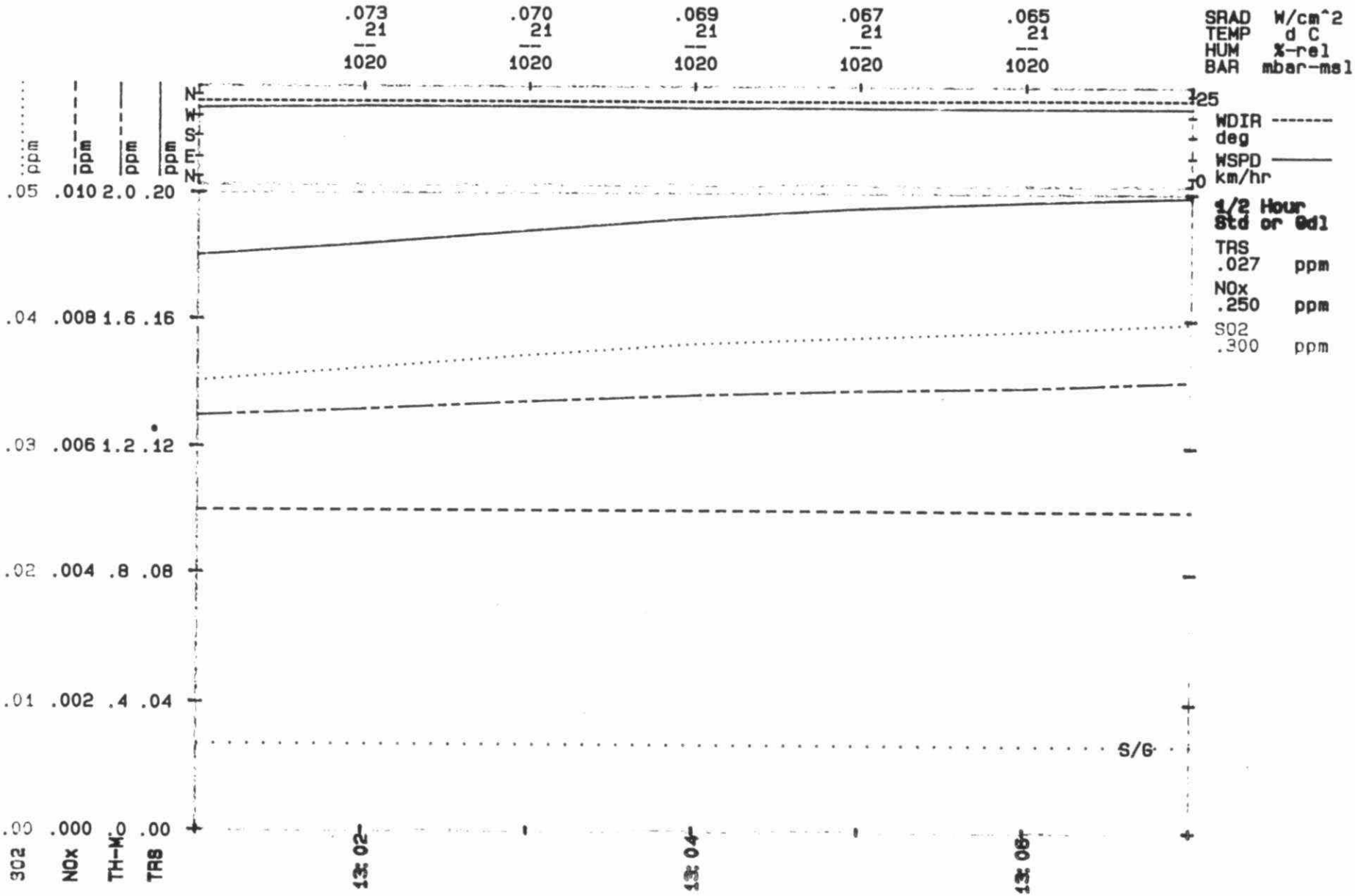
FORT_FRANCES_85: 152B

Start: 85/07/15 11:25 Scan: 60 sec. Ave: 30.00 min.
Loc: SE CORNER LAGOON #3....TRS



FORT_FRANCES_85: 153B

Start: 85/07/15 12:31 Scan: 60 sec. Ave: 30.00 min.
Loc: SE CORNER LAGOON #3....TRS



FORT_FRANCES_85: 154B

Start: 85/07/15 14:10 Scan: 60 sec. Ave: 30.00 min.
Loc: 8TH ST AT CORNWALL AVE....TRS